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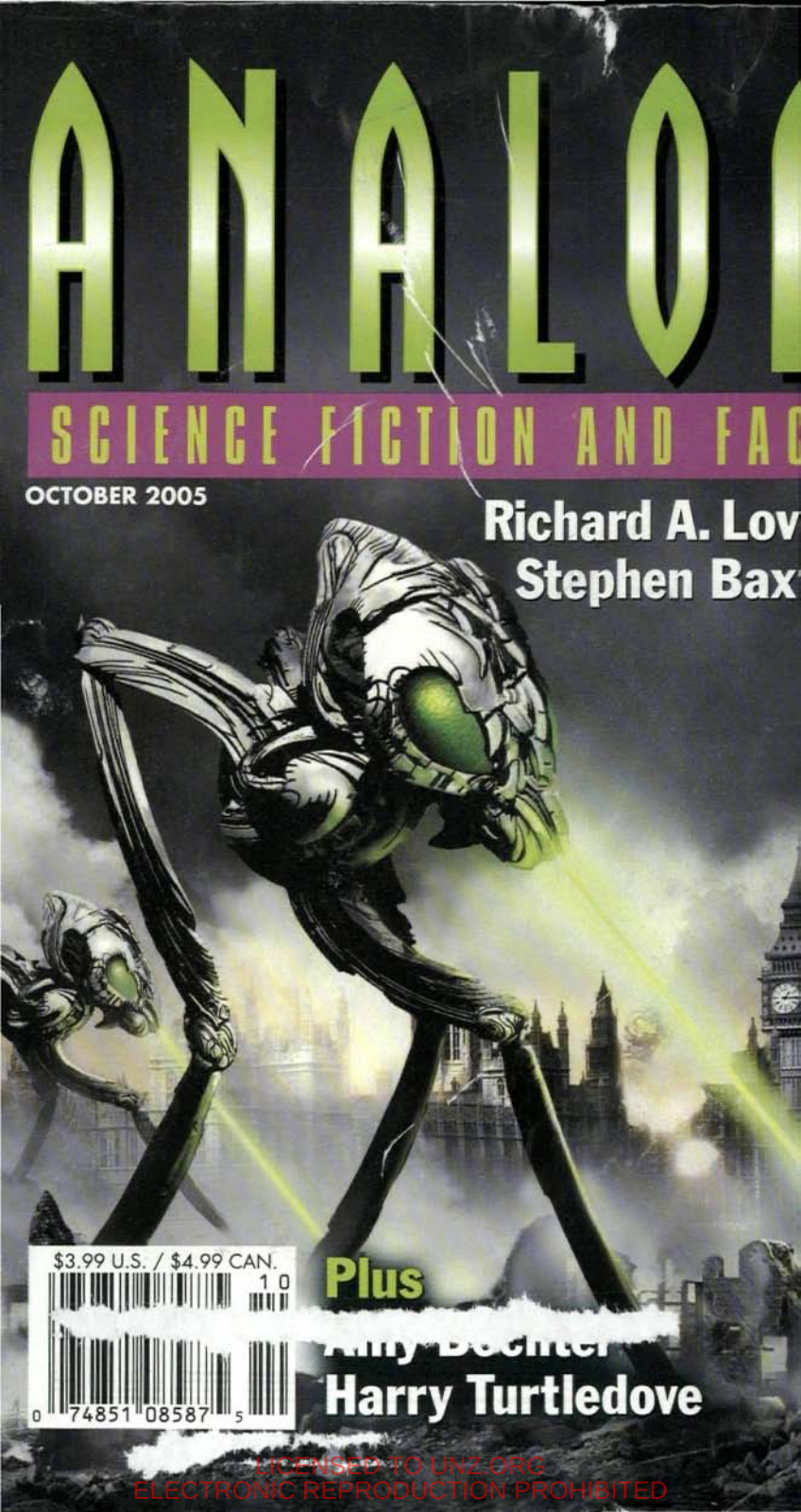

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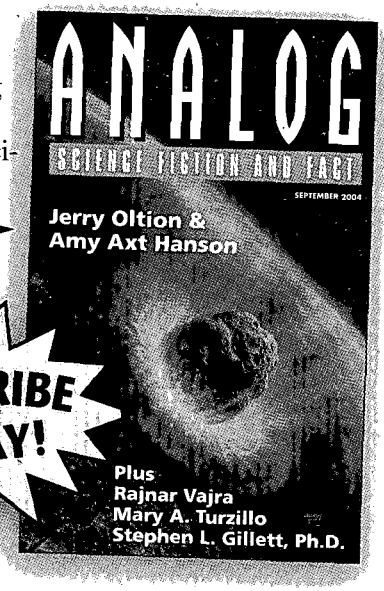

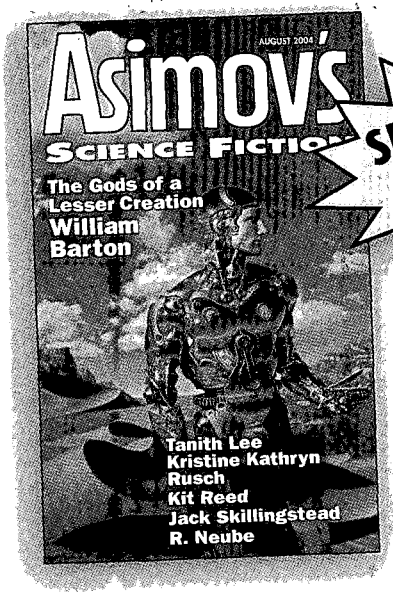

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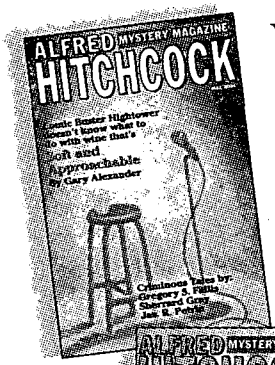

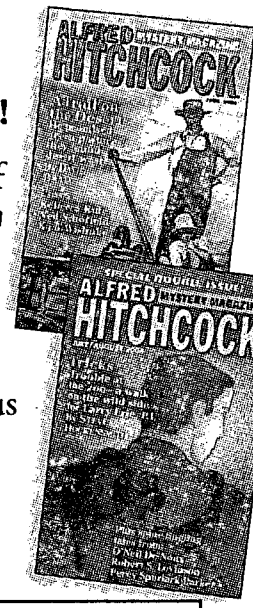

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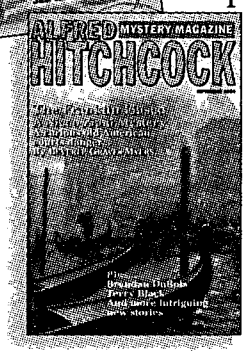

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EDITORIAL Stanley Schmidt

COWARDICE IN THE CLASSROOM

Back in 1925, a young teacher named John T. Scopes created such a nationwide stir that the phrase "Scopes trial" still conjures up instant and powerful images. The charge: violating a Tennessee law prohibiting the teaching of evolution. The case was set up by the American Civil Liberties Union as a test case for the constitutionality of that law, but the judge took care to avoid letting it become that. The court considered only the question of whether Scopes had violated the law by teaching evolution, deliberately sidestepping such questions as whether the theory had merit and whether the law was constitutional. Inevitably it found him guilty, and fined him $100 (which was quite a bit in 1925). He was later acquitted on the grounds that his fine had been excessive, but the state supreme court upheld the law as constitutional. It was finally repealed in 1967(!), and though I haven't confirmed this directly, the logical inference would be that evolution continued to be barred from Tennessee schools until that late date.

In many other places it wasn't. When I was growing up in public schools in southern Ohio in the 1950s and early 1960s, evolution was a standard part of the science curriculum. It wasn't always particularly *well* taught, but it was there and I never heard any brouhahas over whether it should be. But two playwrights, Jerome Lawrence and Robert E. Lee, recognized that that kind of brouhaha was not safely buried in the past and could not be forgotten. In 1955, they wrote a powerful play called *Inherit the Wind*, obviously based on the Scopes trial, but not a mere retelling of it. It had differently named but recognizably parallel characters, and got much more into the philosophical problems surrounding controversial ideas and intellectual freedom than the real trial was allowed to. The authors wrote a preface to the play emphasizing that it was not history or journalism, but theater. The preface ends with these words: "The stage directions set the time as 'Not too long ago.' It might have been yesterday. It could be tomorrow."

Those words now seem chillingly prophetic: Lawrence and Lee's "tomorrow" has arrived, with a new kind of insidiousness.

In recent years, we've seen a recent trend toward suppressing the teaching of evolution by sneaky, roundabout ways. There's no outright ban, which makes the trend harder to fight because it doesn't present as clearly defined a target, but the effect is almost as if there were. One of the more blatant new approaches, which most people have heard about and some courts have tried to stop, is the practice in some areas of putting disclaimers in science textbooks stating that "evolution is just a theory, not fact," or requiring that evolution and "creation science" be taught by side as equally valid options. These approaches do students a grave disservice because there *is* an essential difference between the two. One is supported by an over-

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whelming mass of interlocking evidence from such fields as morphology, paleontology, biogeography, embryology, population genetics, molecular biology, and genomics. The other is pure dogma. The "just a theory" argument shamelessly misuses and abuses the word "theory," treating it as if it meant "an arbitrary guess" rather than "a system of principles and logical relationships that can be used to explain the known facts in an area of knowledge and to predict others, which can then be tested by observation."

Yet it seems the most dangerous approach of all, in terms of the sheer amount of damage being done in today's educational environment, is the widespread hypocrisy of maintaining official curricula that, on paper, give evolution its due but in practice simply ignore it. (See, for example, recent coverage in *Time* and *The New York Times*). Even if textbooks and official curriculum outlines include evolution, more and more teachers are simply skipping over it—either completely or by giving it so little time or discussion that they might as well not bother at all. Why? Because they don't want to risk the wrath of fundamentalist parents or local rabble-rousers.

Or their bosses. Sometimes it isn't the teachers themselves who are afraid to antagonize the ignorant by doing their jobs, but principals or superintendents who have the same fears and find ways to make teachers in their schools feel that it would be safest to avoid dangerous subjects. In such cases at least some of the cowardice is not in the classroom, but in the front office. But that doesn't let teachers off the hook. As I recall, "I was only following orders" fell out of favor as an excuse quite some time ago. People are responsible for doing what they should, whether or not it's popular and even if somebody else orders them to do something they know they shouldn't.

Yes, I realize that people need jobs and must be wary of doing things that will jeopardize them. However, people can and should set limits on what they will do for money. There are names for those who will do anything for a price, and it sometimes takes courage to avoid being forced into that position. If you're trying to do a job that you consider deeply important—and any teacher should feel that way about his or her job—you have a moral obligation to do it to the best of your ability. If somebody tries to force you to do it in a way you consider wrong, you have an obligation to resist that pressure and get the rules—written or *de facto*—changed. If it's just you against a big System, you may not be able to do much. In that case, concerted action is needed. That, among other things, is what unions are for. (Though they may not be enough. In some places, the creationists may outnumber the scientists—but they're still

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wrong. Numbers have nothing to do with truth, but a lot to do with clout.)

I realize also that not all teachers who stifle understanding of evolution by ignoring it are being forced or pressured to do so. Some are themselves believers in creation "science" or its latest, slipperiest incarnation, "intelligent design." I've even heard of extreme cases of people earning advanced scientific degrees just so they could use the language of science to "debunk Darwin"—much as a good science fiction writer can make fictitious science sound so much like the real thing that most readers can't tell the difference.

But the real thing is one of the greatest achievements of human minds, and one of the most powerful tools we have for understanding the universe and learning to live in it. The central concept of science, borne out by thousands of years of observation and testing, is that nature follows rules and can thereby be understood and dealt with. This is true regardless of how you think the rules were established—and at a basic enough level, none of us can do more than guess about that.

So there's no excuse not to teach evolution in a course calling itself "science," even if you buy "intelligent design." Personally, I don't, because (a) the justifications advanced for it involve a level of vague hand-waving that would be tolerated in few if any other areas of science, and (b) it doesn't really answer the question of origins. (If we're too complicated to have arisen without intelligent guidance, how did an even more complex intelligence come to be there before us?) But that doesn't matter, because we *know* that *evolution happens*, right now, regardless of how it got started. Even the intelligent-design theorists, or at least some of them, recognize this.

The most direct evidence comes not from fossils and comparative anatomy, but from molecular biology. Of course there's still plenty to be learned about the detail, but the basic framework is well established. Biologists now know in considerable detail how genetic instructions are coded and transmitted by DNA, how mutations caused by outside influences such as radiation and chemicals can change those instructions, and how natural selection causes beneficial changes to become widespread and harmful ones to die out. That *is* evolution, and we can watch it happen.

We don't normally notice it in big,

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slowly reproducing animals like people or even mice, not because it doesn't happen, but because the time scale is too long. When generations are months or years long and litters are small, it takes too long for obvious changes to accumulate. But it's been observed many times in experiments with fruit flies, for example, which lay lots of eggs and live whirlwind lives. It's an acutely practical problem in medicine, where pathogenic microorganisms evolve new, drug-resistant forms faster than new drugs can be developed to fight them.

And the molecular mechanisms and processes that make these things happen work *exactly* the same way in us as in all other Earthly organisms.

So the fundamentalist position that all the lifeforms we see today were created in their present forms a few thousand years ago is, to put it bluntly (and it *needs* to be put bluntly), logically untenable. The present forms of organisms include susceptibility to mutation and natural selection. That means change; we can and do watch that change happening now. If everything was created in its present form, that must include the present characteristics that lead to change—or evolution.

That doesn't stop True Fundamentalists, of course. Having dug into a logically insupportable position, they defend it tenaciously by extralogical means—and expect the rest of us to accept it as the definitive and final argument, trumping evidence and logic.

But that's the very antithesis of what science is about. The essence of science is that evidence, logic, and more evidence are the keys to understanding the world, and evidence and logic say very loudly that evolution happens. It is, in fact, the central concept, the most important concept, in all of biology. Leaving it out and claiming to teach biology is like skipping multiplication because you don't like it and claiming to teach mathematics. It makes a travesty of the whole idea of scientific method being something real and valuable. If you really want to teach science, you have to teach how it works and what it thinks it has learned—including both the accumulated facts and the best theoretical framework we've come up with to explain them—whether or not that supports your preconceived notions. In the case of biology, that best-available framework is evolution, and attempts to keep it out of classrooms cannot be tolerated by anyone who really cares about science.

Far be it from me to deny even the strictest fundamentalists the right to promulgate their beliefs—but they have no business doing it in science classrooms. Anyone who has read much of my writing knows I'm a staunch supporter of free speech. But that does not mean absolutely any speech, absolutely anywhere. If you broke into my house to rant at me about politics or religion, I would have you arrested with all possible dispatch, even though I would adamantly defend your right to make the same speeches on your own turf or in a hall that you've rented with your own money. If I as a taxpayer hire you to teach science in a public school, I expect you to teach science. I will not willingly tolerate your teaching things in that forum that have no scientific support, or omitting essential ideas that do. Yes, there has to be room for controversy in science; that's an important part of how it grows. But as Kelvin Throop observed in another context, "Just because there's twilight doesn't mean you can't tell the difference between night and day."

The underhanded, back-door suppression of one of the core ideas of biology is a clear and present danger to the future of science in this country. And it doesn't stop with biology. In some places creationists have also decided to attack or ignore inconvenient physics, astronomy, and geology.

I recently visited a college astronomy

Continued on p. 139

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Language Lessons

Amy Bechtel

The technical problems of treating multiple species can be daunting, but there's another pervasive problem that dwarfs them all!

On Wednesday I had to dismantle the refrigerator.

"I'm sorry, sir; I didn't mean to let go of the cat," Aaron said anxiously, "but it *hissed* at me."

"If you had closed the *door* to the cat room before opening the *cage*, we wouldn't be having this problem," I replied, not making any effort to make my voice pleasant. Aaron hung his head, looking wilted, while I contemplated the disaster area in front of me. The refrigerator lay on its side amid massive piles of vaccines, injectables, stool samples, half-used cans of pet food, heartworm tests, and tools. A lumpy spleen in a plastic bag rested against the toolbox. Halfway up the back of the refrigerator, securely wedged among the wires and coils, lay Muffin, a small calico cat.

Wistfully I wished that there was enough large-animal work in town to keep my veterinary clinic busy. No one would ever find an escaped *cow* trapped in the back of a refrigerator. But economics dictated that I would have to continue seeing dogs and cats, and even worse, birds and reptiles. These creatures were very, very good at escaping—I would never forget the hollow, horrified voice of one of my colleagues describing the night when a large snake had slithered out of its cage and devoured a prize cockatoo in the neighboring cage.

But cats were quite bad enough, especially when Aaron was involved. I got on my hands and knees and crawled toward Muffin, who responded by squirming even farther into the bowels of the refrigerator, hissing and struggling. How in the world was I going to get her out? She was wedged so tightly that she was now having trouble breathing. Perhaps I should anesthetize her, to keep her from getting into even deeper trouble. But I had no desire to sedate a cat that was already in respiratory distress. I would simply have to take the refrigerator apart around her. With Aaron's dubious help I

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set to it, and was just beginning to make some headway when Kami, my receptionist, came and hovered over me, looking around in bewilderment.

"What are you doing, Dr. Clayton?" she asked.

"What does it look like I'm doing?" I snapped irritably. "I'm taking a cat out of the refrigerator."

"Oh." Kami hesitated. "Can you talk to Mrs. Campbell about Sparky? She's on the phone."

"*No*, I can't talk to her now. Take a message, Kami."

"All right." Obediently, Kami returned to the phone. As I took more parts off the refrigerator I heard her say, "I'm sorry, Mrs. Campbell, but Dr. Clayton can't get to the phone right now. He's taking a cat out of the refrigerator. May I take a message and have him call you back?"

I sighed. Kami was not much better as a receptionist than Aaron was as a kennelman. I missed my assistant, Tegan, more than ever. If she'd been here today, I would not be looking forward to explaining to Mrs. Campbell that I did not normally house cats in the refrigerator. I would not, in fact, be dismantling the refrigerator at all. But now, at last, I could reach Muffin. I grabbed her around the middle; she struggled and tried to embed herself in the coils again, but I managed to drag her out. I deposited her in her cage and watched her for a time. She was gasping for breath, but as the minutes passed her breathing slowly became less labored, and I let out a long sigh of relief. There had been nothing wrong with Muffin when she'd come into my clinic; her owner, Mrs. Davis, was having work done on her house and had decided to board her cat here for the duration. Presumably she had thought that Muffin would be safer here. I couldn't help imagining a gruesome scenario in which I had to tell Mrs. Davis that her cat had died from being boarded at my clinic. I groaned, and put a hand to my head.

Oh, how I missed Tegan. Mournfully I thought back to the day I had hired her. On first sight—complete with spiked magenta hair, tattoos, and a forgotten lizard in her hair—she had seemed an extremely unlikely candidate for the job. But in spite of first impressions, she had turned out to be the most committed and hardworking employee I had ever seen. Well, first impressions, for me at least, were often faulty. Aaron, for example, had seemed to me to be reasonably capable and intelligent during his job interview.

But in any event it was not just because of her value in the workplace that I missed Tegan. I had fallen in love with her, and in fact had gone so far to ask her to move in with me—but before she even had a chance to tell me *yes* or *no*, she'd had to leave town. Family business, she had said. She hadn't known how long it would take. But now she'd been gone for almost four weeks, without so much as a letter or a phone call, and I was starting to get very nervous indeed. Suppose she never did come back?

From the treatment room I heard a cheerful voice. "Right this way, Mrs. Davis," Kami said. "Muffin's here in the cat room."

Startled, I turned around and looked out the cat room door. Kami was leading Mrs. Davis across the minefield of the disassembled refrigerator. Mrs. Davis stepped carefully over a pile of assorted vaccines, looking extremely uncertain. I hurried out to greet her.

"Hello, Mrs. Davis!" I said brightly. "You must be here to visit Muffin." And if she'd come ten minutes sooner, she'd have discovered her cat stuck in the back of the fridge . . . "Muffin's right in here," I said, showing her into the cat room, where Muffin sat in her cage—no longer gasping for breath, thank God, but still breathing heavily. "We've just moved her to a new cage, and she's a little bit stressed out by that, ha-ha! But I'm sure she'll calm right down now you've come to visit."

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Once I had Mrs. Davis settled in a chair with her cat in her lap (and the cat room door securely closed) I fled back to my office and sat at my desk with my head in my hands. Today had not been a good day. During my first appointment I'd called Aaron in to help restrain a little white poodle so that I could examine its ears, only to find that Aaron had eaten cheese puffs for breakfast and had not washed his hands since. The elderly couple who owned the poodle had not been amused by the orange stains on its impeccably groomed fur. And the day had gone downhill from there.

Outside my office door, I heard Kami and Aaron arguing about how to re-assemble the refrigerator. One thing was certain; if I left them to do it, the fridge would never function again. I groaned, got to my feet, and headed out of my office to face the rest of the day.

The rest of the day passed in much the same way. Aaron broke a window with the mop handle, Kami scheduled three exams in the same fifteen-minute slot, and I managed to mortally offend a new client by giving a compliment to his horse. "What a pretty little mare!" I told Mr. Miller. "It looks like she has a bit of Arabian in her."

There was a long, frosty silence. Then Mr. Miller said, "She's a *pure-bred* Arabian."

"Oh," I said. I managed not to tell him that his mare was the oddest looking pure-bred Arabian I'd ever seen, but I was still fairly certain that Mr. Miller would not be coming back to see me again. A pity, really. I did so enjoy horse work.

Then at last the day was over, all but the last appointment—clipping the wings on Mrs. Johnson's pet cockatiel. Surely nothing could go wrong with such a simple procedure as that.

"It was a nightmare," I said in a hollow voice, staring into the depths of my coffee and wishing it was something much, much stronger. Across the café table from me, my old friends Howard and Lynda Winston listened sympathetically.

"Aaron was holding the bird, and I reminded him not to press down too hard, so of *course* he let it go entirely. So there it was, flapping around the exam room, but there wasn't anywhere it could go, right?" I fumbled for my cup and took a deep gulp. "So I caught it in a towel, but the damned bird faked me out. It went limp, and I took off the towel to check on it, and it flew off, and just then Kami opened the door and off it went into the waiting room . . ."

Lynda, who had once worked at my clinic, was cringing.

"So the bird was loose in the waiting room, and Aaron was chasing it, and Mrs. Johnson started screaming, and then the bird flew smack into the window and knocked itself out—God, I though it was dead."

"*Was* it dead?" Howard asked anxiously.

"No. Thank God."

"Is it a lawsuit?" Lynda asked. She was always very practical.

"I don't know yet." I sighed. "I tell you, if my pager goes off tonight, I'm going to scream."

Immediately, my pager went off.

A few minutes later I was hurrying back to the clinic at unsafe speeds, with Howard and Lynda following my truck at a more sedate pace. Mrs. Seaton had been hysterical when I'd spoken to her; her dog, Mishka, had gotten into a fight with the dog next door. "She's bleeding to death, Doctor, I'm sure of it," she'd gasped.

When I pulled into the parking lot, Mrs. Seaton was already there, standing at the door clutching a fluffy white dog in her arms.

"Let's get her inside and onto the exam table," I said, in my best competent-and-professional voice. Quickly I unlocked the front door and switched on

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lights. "Put her here on the table. That's it. Now let's have a look."

Mrs. Seaton stepped back, trembling, as I examined the dog. Mishka's eyes were bright, her ears pricked; her gum color was excellent, and I couldn't find a trace of blood anywhere.

I heard the front door open and close, and Lynda hurried into the exam room to help me with the dire emergency. I saw her looking over the dog with confusion. Obviously she didn't see any blood either.

Baffled, I made another circuit of the dog, peering closely to examine every centimeter of fluffy white fur. I still couldn't find any blood.

"Um—Mrs. Seaton?"

"Yes, Doctor?"

"Where, um, where would you say the, um, *worst* of the bites is?"

"Her right front leg," Mrs. Seaton said faintly.

I began a minute examination of the right front leg, parting the fur to inspect the skin. At last I found the place where the dog was bleeding: a tiny puncture wound adorned with a microscopic spot of blood. I'd never have found it on my own.

"How bad is it, Doctor?" Mrs. Seaton asked. "How many stitches will it need?"

"Well now, it really isn't too bad," I said, mastering the art of understatement. "And it won't need any stitches. It's a puncture wound, and those need to be left open." It would be impossible to stitch it anyway, of course; it was much too small. But I made a great show of clipping the fur and washing the wound, and Mrs. Seaton left the clinic pleased with my work and convinced that I'd saved Mishka's life. There didn't seem to be any point in trying to tell her otherwise.

There was a long silence in the clinic. At last Lynda said, "Do you know, I'd almost forgotten how *peculiar* your clients are."

I sighed. "I haven't. Where's Howard?"

"He dropped me off so he could pick up some papers at his office. We figured that I'd be here helping you for quite a while; a dog bleeding to death and all, you know. I'll give him a ring and let him know we're already done—oh wait, maybe I won't."

My pager had already gone off again. This time it was a Mr. Williams, calling because he was concerned about his dog, which had a cut on its leg. This story was beginning to sound familiar.

"Do you think it's an emergency?" Mr. Williams asked. "Because if it isn't, I'll just bring him in tomorrow."

"Well, that's hard to say over the phone. Is the cut very large? Is it bleeding?"

There was a long silence, as Mr. Williams presumably examined the dog. "It's maybe a couple inches," he said at last. "It's bleeding some. Do I need to bring him in?"

"Well, that's up to you," I said. "If there's very much bleeding, you should bring him in tonight. If there isn't, you can probably wait until morning."

"How much bleeding is very much?" Mr. Williams asked.

"Maybe you should just bring him in," I said with a sigh.

"Are you sure? That emergency fee of yours is kind of steep, you know."

"I *can't* be sure over the *phone*," I snapped, thoroughly irritated. "Just tell me if you're bringing him in or not."

"Hold on." I heard a clunk as the phone was put down, and then I heard Mr. Williams and a woman arguing.

"What do you mean, he'd not sure?" the woman said. "He's the doctor, isn't he?"

"Well, he wouldn't tell me what *very much* meant."

"*How* much is the emergency fee? Oh, that's outrageous. Anyway, I don't think it looks all that bad."

"So let's take him in tomorrow."

"But what if he ought to go in tonight? I can't believe that doctor won't tell us."

Ten minutes later, a consensus was

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reached: Mr. and Mrs. Williams were going to bring in their dog. I sighed. I'd really been hoping they'd just wait until tomorrow.

"So how are things?" Lynda asked, sitting with me as I waited for my emergency to arrive. "How is Aaron doing overall—apart from handling birds, that is?"

"He lost a cat up the back of the refrigerator this morning," I said morosely. "And someone's supposed to come repair the lab window tomorrow."

"Oh." Lynda was silent for a moment. "Er—how about Kami?"

"Same as always."

"Oh."

I smiled faintly. "I don't suppose you'd like to have your old job back? It would just be temporary, you know. Till Tegan gets back."

I was quite sure she'd say no, as I'd asked the same question many, many times before, and she'd always said no. She'd left the clinic when she married Howard, and had gone to live on his remote ranch at the end of Caliente Canyon, where she now helped look after horses, cattle, a multitude of reptiles, and eight enormous sea monsters that lived in a huge hidden pool. The sea monsters were Howard and Lynda's most precious secret, creatures that had never before been seen anywhere in the world, and Lynda was spending prodigal amounts of time trying to decipher the whistles and squeaks that made up their language. I hadn't asked her about her work lately because it didn't seem to be going well; the monsters' language was apparently about as difficult to decipher as their physiology—in other words, impossible. I was very fond of the sea monsters; they were intelligent and personable and extremely friendly, but as a veterinarian, they were my worst nightmare; whenever they were sick, I became a twitching, nervous wreck.

But Lynda didn't say anything about the importance of spending time with her monsters or about the unreasonable length of the commute to the clinic. Instead she frowned, and said, "Michael, when *is* Tegan coming back?"

The question put a cold chill of fear into the pit of my stomach. "Well, I don't know exactly," I said. "She took a leave of absence. It was something to do with her family. She didn't seem to know how long it would take."

"Why don't you give her a call? Find out how things are going?"

"Well, I can't." Saying it out loud made all my fears and insecurities rise to the surface. *Why didn't she leave a phone number or an address?* "I don't have her number."

"Can you write to her?"

I shook my head. "I don't have an address."

"Has she called you?"

"No."

"Oh, Michael." There was pity on Lynda's face, and she laid a hand on mine. "I'm so sorry."

"She *is* coming back," I said, pulling away from her. "If nothing else, she left her pets in town. She has to come back for them."

Lynda looked down, shaking her head. "That's the thing, Michael. I don't know how to tell you this."

"Tell me what?"

"It's something Howard just found out when he was teaching his poetry class. You remember Adam Brophy, don't you? The big biker fellow who adopted that nine-foot snake you had?"

"Of course I remember him." It wasn't every day you saw a huge bearded biker reciting poetry to a huge snake.

"Well, he has Tegan's lizards and snakes now. Her plants, too."

I shrugged. "So he's pet-sitting."

Lynda shook her head again. "No, Michael. Adam says Tegan sold them to him. She's not coming back for them."

"Oh." I couldn't think of anything else to say. Tegan had sold her beloved reptiles? She'd sold her plants? It seemed impossible. She had had a great many

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plants; her little apartment had been a positive riot of greenery. I'd asked her about them once, and she'd laughed and told me that every time she got depressed, she went out and bought a plant. She'd been joking, of course. Tegan was always bright and cheerful, even when she was cleaning up parvo diarrhea in the isolation room. That brightness was a great part of why I'd fallen in love with her. I could not even imagine her being depressed.

"Lynda?" I said, in a very small voice. "Do you think Tegan was depressed, before she left?"

Lynda looked thoughtful. "I didn't ever think so," she said, "but Howard did. It was something he saw when she was in his poetry class, I suppose."

I was silent. Oh, Tegan. She'd been depressed, and I'd been too moronic to notice even when she'd told me so to my face. And now she was gone. To visit family, she'd said, although I'd never once heard her speak of family before. It was obvious now. I'd pushed too hard, asking her to move in with me, and she'd left because of me. The leave of absence to visit family had been a polite fiction. She was never coming back.

"Michael?" Lynda was looking at me in concern. "Will you be all right?"

At that moment the front door opened, and a young couple sauntered in with a large greyhound on a lead. The greyhound had a sock bound loosely around a gaping wound in its hind leg, but the makeshift bandage had slipped down the leg and was doing nothing at all to staunch the bleeding. *Lots of bleeding* didn't begin to describe it. Arterial blood was spraying everywhere, all over the waiting room, the reception desk, and the dog's nonchalant owners.

Half an hour later, as I put the last few sutures into the greyhound's leg, I heard the front door open. Oh, wonderful. In all the chaos, I'd forgotten to lock it. But then, if the intruder were a burglar, or even a murderer, the condition of the waiting room would probably scare him away. There were great pools of blood on the floor, with sprays and splashes of blood on the walls, the desk, and the benches, and I was fairly certain there was blood on the ceiling as well.

"Hello?" The voice was uncertain and quavering, but it was definitely Howard. I sighed with relief.

"Hi, honey," Lynda called. "Come on in. And lock the door behind you."

Cautiously Howard came in to the treatment room, trying not to step in any blood. He looked extremely queasy. "Did all that blood come from this dog?" he asked, blinking behind his glasses.

I nodded. Certainly none of it had come from Mishka.

"Wow. Is he going to live?"

"Probably. No thanks to his owners."

Lynda giggled. "You'll never believe what happened, Howard. This dog was spouting blood everywhere, but when Michael raced up with a tourniquet and pressure bandages, they *stopped* him."

"Stopped him? But why?"

"Isn't it obvious?"

Howard shook his head.

"Because it would cut off the circulation." Lynda grinned. "And it was circulating so *well*, too."

"You're kidding," Howard said uncertainly. "Aren't you?"

"Nope," I said, putting in the last suture. "I swear, I had to argue with them for five minutes. I thought the dog was going to bleed out right there in the waiting room."

Lynda efficiently turned off the anesthetic machine, trundled it out of the way, and set to work cleaning up the blood. Howard looked at me nervously and said, "Did Lynda tell you?"

"Yes. She did." I spread a blanket on the floor and laid the greyhound on it, where I could keep an eye on the dog's recovery while I cleaned.

"Are you going to be all right?"

"I don't know." I really didn't. I was still numb. But Howard looked so wilted that I managed to force a smile. "It's fun-

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ny," I said. "Here I was, worried sick that you were going to tell me that something was wrong with your sea monsters. That was the worst news I could imagine. But now I wish to God that was what had brought you here."

Lynda and Howard exchanged an uncertain, furtive glance, and I looked from one to the other in horror.

"You can't mean it," I said faintly. "There's something wrong with the sea monsters *too*?"

The next day I wandered through my work like a sleepwalker. I was in a fog, and all I could think of was Tegan. I replayed every conversation we'd ever had, trying to pinpoint the place where things had gone wrong, and when I saw Aaron blithely moving cats from one cage to another with the cat-room door wide open, I couldn't muster the energy to correct him. Every now and then my thoughts turned to the monsters, which was almost as bad. Howard and Lynda had said there was something wrong with Curious—my favorite, of course—and that though it didn't seem to be an emergency, it was very strange. The thought of something *strange* going on with the sea monsters was enough to make me twitch even now, deep in depression though I was. How was I supposed to diagnose what was wrong with a sea monster when I still didn't understand their normal physiology? It was impossible. It couldn't be done, and I might as well give up now. I sat down at my desk, pulled out my file on the monsters (which I kept hidden away in the workers-compensation folder) and tried to study it. But all I succeeded in doing was writing Tegan's name in the margins, over and over.

I was still deep in gloom when I started the day's small-animal surgeries, although with the exception of a little dog named Ozzie, I had nothing on my board more difficult than routine spays and neuters. Ozzie had an obstruction in his small intestine, and though he was a young dog in good condition, I was still a bit nervous about what I might find. I started out with a cat spay, a simple twenty-minute procedure that ought to be a good warm-up for the real work ahead.

But over an hour later, I was still frantically puddling through Alley the cat's abdomen, trying to locate the uterus. I was baffled. Alley was six months old and had been born in the owner's household, so there was no chance that she had been spayed anywhere else. Where could the uterus be? I'd spayed a few cats that had had only one ovary and one horn of the uterus, but in this case I couldn't find anything at all. What in hell was going on?

Suddenly my stomach sank and I shuddered as if a bucket of cold water had been poured over me. *Had I checked to make sure that this cat was female?* I always did; it was routine, a reflex. But I had been in such a fog this morning . . . and many of my colleagues admitted to having, at least once, attempted to spay a tomcat . . .

I covered my incision with a sterile towel, lifted the drape, and leaned over to look under my patient's tail. Yes, Alley was definitely female; she had a vulva. I must have checked after all. But then, where was the uterus? If Alley had turned out to be male, as mortifying as that would have been, that would at least have told me what was wrong.

Aaron, apparently assuming that I'd finished the surgery, took the mask off Alley's face and started to wheel the anesthetic machine away. "No!" I yelped. "Put that back! We aren't done yet."

As Aaron put everything back together, I leaned closer to peer at the vulva. This close, it did look a little ... strange. There was an odd, tiny swelling on each side of it. I stripped off my gloves and palpated the barely-visible swellings, and I couldn't help groaning as I realized what they were. *Testicles.* One on each side of the vulva. This was no ordinary cat.

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Soberly I sutured closed the massive incision in the abdomen, and then removed both of the tiny, atrophied, buried testicles. What a dismal mess. This poor cat would now have to recover from a major abdominal surgery that had been quite unnecessary, and I certainly would not be able to charge for my extra time. So much for the warm-up surgery.

To my surprise, Ozzie's surgery went very well indeed. I found the offending length of small intestine in moments, and sighed with relief. It was a simple obstruction, not a tumor, and it had not yet done major damage to the intestine. I would be able to make a small incision and simply pop the thing out, whatever it was.

But what was it? Slowly I drew it out, and looked at it in bewilderment. It looked like a puppy, so much like a puppy that I glanced hastily down to make sure I had made an incision in the small intestine and not the uterus—never mind that Ozzie was, without any doubt, male.

I cleared some of the mucus from the puppy's face, feeling completely adrift, and a pair of felt eyes stared back at me.

"What is that, sir?" Aaron asked. "Is that a *puppy*?"

"So it is," I said, gazing at it in awe. The little stuffed toy did not even have any bite marks on it; Ozzie must have swallowed it whole, which was truly a prodigious feat for such a small dog.

"Wow," Aaron said. "Why would a dog eat something like that?"

I shrugged, changed my gloves, and started to suture the intestine. In my experience, dogs would eat anything in the known universe, including socks, underwear, dental floss, Easter grass, rubber bands, needles and thread, rocks, fishhooks and wedding rings. Last year I'd examined a dog that had munched her way through several cases of light bulbs. There was no point in trying to figure out why.

Curious, the sea monster, had been known to eat bizarre things too. I hoped that wasn't what was going on this time; I'd done surgery on him once before and I did not want to ever, ever, have to do it again. Particularly since now I wouldn't have Tegan present, holding Curious' fin and soothing him through the procedure.

I was pleased that I'd been able to take care of Ozzie so easily, and while I'd been working on him I'd almost managed to drive Tegan from my mind, but now the thought of the sick sea monsters began to weigh on me. I had promised to see them that evening, and since I wasn't on call, there would be no convenient emergencies to hold up as an excuse.

Howard and Lynda lived on a huge, remote ranch at the end of Caliente Canyon. It was a wearing fifty-mile drive, compounded by the dreadful condition of Howard's road. The trip from Howard's gate to the monsters' pool involved jostling the truck over huge rocks, through deep pits, and around tight switchbacks that leaned out over spectacular cliffs. I hadn't minded the drive when Tegan rode with me; in fact, when she was with me the trip had seemed hardly long enough. But now it was endless and miserable.

When I got to the pool, Howard, Lynda, and the monsters were waiting for me. The Sun was low over the mountains, glowing on the surface of the pool, and the monsters were splashing and playing. All except one, which lay listlessly in the shallows by Lynda's feet. I swallowed, trying to find my nerve, and got out of the truck.

Both Howard and Lynda greeted me, and as they asked me how my day had gone they were careful to make no mention of Tegan. I told them my day had been fine—well, part of it had been—and knelt in the shallows to examine Curious.

Curious was a big monster now, much bigger than he had been on that

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dreadful day when I'd had to do surgery on him. At first glance, he looked perfectly fine. His eyes were bright, his gills and blowhole were clear, his odd spherical body and four-pronged tail looked sturdy and strong. But he certainly wasn't behaving normally, moping at the edge of the pool while his sisters and brothers played.

I took hold of his fin, which was articulated into a number of dexterous tentacles, and concentrated on what I felt. He whistled and squeaked at me, and I wished, as I did with so many of my patients, that I could understand what he was telling me. Since Lynda had not yet gotten anywhere with her language project, the only real communication I had with the monsters came through touch. Strong emotions seemed to be transmitted across some chemical pathway; we could tell when the monsters were happy or sad, excited or depressed, and they could pick up such things from us as well. I tightened my grip on the fin and hoped desperately that this would give me some revelation.

What I felt was odd, and mixed. Depression, pain, and lethargy were there, but there was also something excited, something happy. I let go of Curious and turned to Lynda in confusion.

"What have you been feeling from him?" I asked.

"Well, it's off and on, you know," Lynda said. "Sometimes he seems perfectly normal. At other times he seems to be in pain. That's when he doesn't play, and he just lies down here in the shallows."

"Have a feel now, and see what you think," I said.

Lynda took the fin, concentrated for a moment, and then looked up at me in surprise. "I feel the pain, but he's happy too. At the same time." She stepped back, looking thoughtful. "I expect he's happy because you're here, and he knows you'll make him feel better."

My heart sank a bit further. I didn't think I was going to be able to make him feel better this time. The last time he'd been ill the problem had been reasonably obvious. Now, his physical exam seemed totally normal. Obviously I was missing something. But what?

I went through the motions of the physical exam again without discovering anything new, and then drew a blood sample from the tail vein. The monsters never seemed to mind when I took blood samples from them, which was fortunate since they were now much too large to physically restrain. Curious then settled himself in the shallows, his blowhole out of the water, and lay quietly.

I watched the other monsters for a time, trying to see if anything might be wrong with them, but they went on playing quite normally. I coaxed a couple of them to my hand so that I could touch their fins, but they radiated nothing but well-being. Whatever the problem was, it was only affecting Curious—at least so far.

Howard looked at me expectantly. "What's wrong with him, Michael?" he asked.

Even after all the years he has known me, Howard still seems to believe that I can diagnose everything at a glance.

"I don't know," I said gloomily. "I don't have any idea."

"Oh, that's right," Howard said. "You'll have to check the blood sample."

I was fairly certain that the blood sample wouldn't tell me anything at all, but I nodded.

They asked me to stay for dinner, but it was a tense and rather quiet affair, with both Howard and Lynda working hard to make no references to Tegan, and I left as soon as I politely could.

When I got the blood results back I sat down with the monsters' file, comparing the numbers to blood work I'd done in the past. As I'd expected, the results weren't useful at all. The numbers almost precisely matched those I'd collected from normal monsters as a baseline. I was back to square one.

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Kami stuck her head into my office and said, "Dr. Clayton? There's a woman here to see you. From the state veterinary board." She smiled cheerfully.

My heart lurched, rather more violently than it did when I saw flashing lights in my rear-view mirror. I did my best to keep the practice in good shape, but I was not good at paperwork. Panicky thoughts flitted through my mind. Were the x-rays filed correctly? Were the controlled-drug logs balanced? Would she interview Kami and Aaron? God, she probably would, and then I'd lose my license for sure. In fact, she might be talking to Aaron even now. I leaped up, nearly knocking over my chair, and raced out to the waiting room. The inspector was still there, examining my license with a frown. I wondered desperately if I'd remembered to post my latest renewal card—but at least she wasn't talking to Aaron.

"Good afternoon, Dr. Clayton," the inspector said gravely. "I am Dr. Beals. I've come to inspect your premises."

"Yes, yes, of course," I babbled. "Shall I show you around, or would you rather, ah, look around on your own?"

"I'll look around on my own, Dr. Clayton. You and your staff may carry on as usual."

As usual? God, I hoped not. I pictured Kami making appointments for poisonous snakes while Aaron chased escaped cattle down the street. I closed my eyes briefly and prayed that my staff would function well above its usual level.

But every time I ran across Dr. Beals as I worked, she had something else to tell me. "Dr. Clayton, did you realize that you had expired product on your shelves? These doxycycline tablets expired a month and a half ago."

"Oh dear. No, I didn't realize. I almost always use the capsules, you see, and—"

"And I see you have a broken window. This cardboard over the hole is hardly sufficient."

"Oh yes, well, they were supposed to come and fix the window yesterday but—"

"And here in your dispensary I see you have a pill bottle ready to go out without a child-proof cap."

"Oh, that's for Mrs. Sanchez; she has arthritis and—"

"Nevertheless you must dispense the medication with a child-proof cap. If the client so wishes, you may also dispense a regular cap which she may use once she is home."

"But how is she supposed to get it off in the first place if—"

"Now I should like to inspect your library. If you'll show me where it is, please."

"Certainly, certainly." I led her back to my office and shakily pointed out the bookshelves. I didn't have to worry about my library, at least. It was quite complete and up to date, and because of Howard there was a particularly extensive exotics section. My payroll records were a disaster area, but surely the veterinary board would not be interested in them.

After Dr. Beals had written some ominous-looking notes about my library, she swung around and said, "I would like to take a look at your files now."

At that instant I realized I'd left the monsters' file open on my desk. I couldn't stop myself from looking toward it, and Dr. Beals followed my gaze. "Ah, let's have a look at this one," she said, picking it up from the desk. I stood in the doorway staring at her, unable to speak, move, or breathe. Howard had worked so hard to keep his monsters secret, and here I'd given everything away. What could I do now? I pictured tackling Dr. Beals and flinging the file into the shredder, but then I'd not only lose my license, I'd be arrested. Should I do it anyway, just to protect the monsters? Or was it already too late?

Dr. Beals looked up at me, and I stared back at her like a frightened rabbit. "Dr. Clayton," she said severely, "you have not initialed these entries. Anything you

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write in your charts must be initialed." She put down the file and moved on.

Once she had disappeared down the hall, I sank into my chair and put the file into the workers-compensation folder with shaking hands. I felt an indescribable relief, even though I could hear Dr. Beals interviewing Kami and Aaron in the hallway. I might very well lose my license—but at least I had not given the sea monsters' secret away.

That night I drove down the long road to the ranch to examine Curious again. Howard and Lynda were waiting for me, and just as before, Curious was lying quietly in the shallows while the other monsters played. Curious did seem pleased to see me, and pulled himself most of the way out of the water so that I could examine him more easily—which only made me feel worse.

"If only you could tell me what's wrong with you, buddy," I said sadly. "Couldn't you at least bite me when I touch the spot that hurts, like the dogs do?"

Curious reached out a fin and took my hand, and again I felt that strange melding of illness and happiness. The mixed signals were baffling.

"Has he been acting any better?" I asked hopefully.

Lynda shook her head, and Howard said, "Worse, really."

"And the others?"

Lynda shrugged. "They've been fine."

Howard said, "What did the blood work show?"

"Nothing," I said. "Nothing at all. It came back perfectly normal. I can't find a thing wrong with Curious, but just *look* at him."

I examined Curious again, in increasing desperation, but everything I checked was still normal. Defeated and depressed, I drove back home.

My first client the next morning was a Mr. Duncan, who had brought in his collie, Trixie, because of a lump on her side. Gloomily I examined her. The lump was huge, the size of a small cantaloupe, and the surface was scraped raw and bleeding.

"How long has this been here, Mr. Duncan?" I asked.

"It just popped up, Doctor," Mr. Duncan said anxiously. "Overnight."

Right. It had probably been there for a month at least, but Trixie had scraped it on something during the night. No doubt the blood had suddenly made Mr. Duncan realize that something ought to be done.

"Are you sure of that, Mr. Duncan?" I asked. "Because this lump is really quite large."

"I'm sure," Mr. Duncan said stubbornly. "It wasn't there yesterday."

I was too tired to argue with him, and it didn't matter anyway. The lump needed to be removed as soon as possible. I sighed as I added Trixie to the day's surgery schedule. I probably wasn't going to have time to eat lunch today.

My next patient was Ruby, a toy poodle belonging to Mr. and Mrs. Stone. Kami had made a bewildering variety of entries in the chart, most of which had been crossed out, and the only line still legible read *something wrong with dog.*

"So what seems to be the problem?" I asked, stroking Ruby's head as she panted up at me.

"Well, she's drinking a lot of water," Mrs. Stone said.

"No, she isn't," her husband said immediately. "She's not drinking any more than usual."

Mrs. Stone, ignoring her husband, said, "And she pants all the time."

Mr. Stone shook his head vigorously. "She only pants after she's been out for a walk. But her fur is getting thin, see?"

"Her fur is fine," Mrs. Stone snapped. "The thing is, she's been drinking a lot of water and—"

I held up my hand and asked, "How old is she?""

"Ten," Mrs. Stone said.

"Six," Mr. Stone said.

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"She's ten! We bought the house ten years ago, and we got her that August."

"We bought the house *eight* years ago, and we got her two years after that."

As the conversation deteriorated, Ruby looked up at me with sad eyes. I almost fancied I could see her rolling them as her owners argued. I patted her gently while I made my own assessment of Ruby's age and condition; it didn't seem worthwhile to ask any further questions about symptoms. By her teeth Ruby was closer to ten than six, her hair coat was poor, and the skin on her potbellied abdomen felt very thin. It was almost certainly a case of Cushing's disease, particularly if she really was drinking a lot of water, but I needed to run blood work to be sure. I waited a moment for a lull in the continuing argument, but it never came, so I interrupted them loudly to tell them what I suspected and how much the recommended blood tests would cost.

A new argument began immediately.

"That should be okay," Mr. Stone said. "We've got the money we made from the garage sale set aside."

"What are you talking about? We spent that money on the new furniture; we'll have to take something out of savings."

"The furniture money came from that bonus I got at work!"

"No it didn't; the bonus went to landscaping the back yard."

"I hadn't even *gotten* the bonus when we had the landscaping done; that money came from the tax refund . . ."

I was twitching by the time I got permission from both parties to run the blood tests, and when I sent the Stones out the door with their poodle, they were still arguing, and I was ready to strangle them both.

As the day wore on, things didn't improve very much. Trixie's tumor took a good two hours to remove, as I laboriously clamped and tied the multitude of large blood vessels that supplied it. One of the clamps slipped while I was working, and arterial blood sprayed briefly but vigorously across the room, dousing the walls, floor, cabinets, and Aaron, who promptly got dizzy, had to sit down, and was conveniently unable to clean the splattered surfaces. And, as I had suspected, I never did get a chance to eat lunch. But that afternoon I did get to recheck Ozzie, and his visit was the brightest spot I'd had all week.

When he came into the clinic Ozzie pulled the leash out of his owner's hand and raced into the exam room to greet me. Startled, I sat down, and Ozzie leaped into my lap. Smiling, Mrs. Singleton followed her dog into the room.

"I see he's doing well," I said happily. "He's certainly a friendly little fellow."

Mrs. Singleton laughed and shook her head. "Oh no, I'm afraid he isn't. He's normally very reserved; he hides behind the couch whenever people visit. I've never seen anything like this before."

I didn't often see anything like it either. Usually my patients were quite determined to drag their owners *out* of the exam room, not into it. Did Ozzie actually realize that I had been the one to take his awful abdominal pain away? I felt that he did, and basked in the unaccustomed appreciation from one of my patients.

My last patient of the day was old Mrs. Burlison's pet goat, Adelheid. I sighed as I saw them exit the car and cross the parking lot. I saw Adelheid very frequently, and there was never anything wrong with her.

"What's the problem today, Mrs. Burlison?" I asked.

"Adelheid is limping, Dr. Clayton. Look."

Mrs. Smith led Adelheid up and down the alley beside the barn, and I watched carefully, just in case there really was something wrong this time. But there wasn't. Even so I did a careful examination, checking Adelheid's feet and manipulating all of her joints.

"Well, Mrs. Burlison, I think she just

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must have put her foot down wrong. It probably hurt for a time but it seems to have cleared up on its own."

"Oh, I'm so relieved," Mrs. Burlison said. "I was so afraid she had broken something. My daughter did that once, oh so many years ago; she stepped in a hole and her foot just snapped. And then there was the time when my grandson fell out of a tree; he was eight then and was visiting me at the time, so I was quite terrified that my daughter might not let him visit any more after that . . ."

Mrs. Burlison chattered on for a long time, which was the reason I always tried to schedule her appointments at the end of the day. She lived alone except for Adelheid, and I was fairly certain that she came to the clinic just so she could talk to someone. I couldn't help feeling sympathetic. She was obviously lonely, and I was starting to understand what that meant. I'd always lived alone, and had liked living that way, but meeting Tegan had changed something in me. Now that I'd lost her, now that she was gone forever, I was simply, desperately, lonely for her.

Deep in these thoughts, I sent Adelheid on her way and trudged back into the clinic. I pushed open the back door and made my way across the treatment area in a fog of misery. At the lab table I stopped and sat in front of the microscope, staring at it blankly. Kami hurried up to me, clutching an envelope.

"This got delivered while you were in the barn, Dr. Clayton," she said. "That nice Dr. Beals who was here yesterday brought it by. She said it was your inspection report." Kami smiled brightly, handed me the envelope, and went back to the front office.

I sat frozen at the lab table, holding the envelope, remembering with perfect clarity every fault Dr. Beals had pointed out. Surely they would not simply take my license, though. Surely I would be given a chance to correct my errors. Yes, that was the most likely thing; a warning followed by re-inspection at some other time. I took a deep, nervous breath and prepared to open the envelope.

From the waiting room I heard Kami's voice, greeting someone. Oh God, it must be another client, and I couldn't possibly deal with one more thing today. What was Kami thinking, letting someone into the clinic this long after closing? I was sorely tempted to hide under the table. Or perhaps I could make it out the back door. . . .

Kami was chatting cheerfully to the client. "When did you get in? How was your trip? I really like your hair."

"Thanks, Kami. I just now got into town; the trip went fine."

My hand tightened on the envelope and I spun around in my chair. It was Tegan. She was wearing a flowing white dress and her short hair was glossy and black rather than the usual spiked magenta, but it was, without any doubt, Tegan. She was holding a black-and-white dog on a lead, and she was smiling at me.

"Tegan," I whispered. I couldn't find my voice; all I could do was stare.

Tegan's smile faltered. "Michael? Are you all right?"

"I thought—I didn't think—" My voice still wasn't much more than a croak.

Tegan pulled up another chair and sat down, looking at me in concern. The dog eyed me warily and tugged at his lead, obviously wanting to be elsewhere. Tegan gently pulled him back to her feet and reached down to pet him. "Didn't think what?" she asked.

"Howard said—your snakes—Adam Brophy—"

Tegan looked puzzled. "I don't understand. What about Howard and Adam Brophy?"

"You came back," I said, finally finding my voice. "Are you—planning to stay? To come back to work?"

Tegan looked alarmed. "Can't I? I know you said I could come back, but Kami told me you'd hired someone

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else—Aaron—so I'll understand if—"

"No, no! Of course you can come back!" Dear God, we weren't communicating at all. I tried again. "I've just been so frightened that maybe you *weren't* coming back."

Tegan reached out to touch my hand, which was still clenched on the veterinary-board envelope. "Of course I've come back," she said softly. "I told you I would. Why did you think I wouldn't?"

"Because you sold your plants, and your reptiles," I said.

"Oh." Tegan gave me a wan smile. "I sold some of them," she said. "I hated to, but I needed the money for the trip, and they've got a good home with Adam. All the rest are with my friend Hannah; she's pet sitting. I'm so sorry, Michael. I never thought about you finding out about that, and coming to the wrong conclusion."

"But you never wrote, or phoned," I said, very low.

"I know." Tegan pulled her hand away. "I'm sorry. I was just—overwhelmed."

"No, don't be sorry," I said. "It was my fault, I know; I pushed too hard, asking you to move in with me and all. It's me who should be sorry."

Tegan gave me a puzzled look. "What are you talking about?"

"Well, that's why you left, isn't it?"

"Of course it isn't! Where did you get that idea? I'm sure I told you; it was a family matter."

"Oh." I sat for a moment, contemplating this, wondering how I'd managed to glean such a totally incorrect message from Tegan's departure. I'd always thought that human doctors had a considerable advantage over veterinarians since they could talk to their patients, but now I wasn't so sure. Communicating with people could be hellish—just look at Mr. and Mrs. Stone. I'd learned a lot more from Ruby herself than from her owners. And look at Curious—he *could* communicate, if only in a limited way, but I still didn't have a clue what was wrong with him. And *why* was my mind spinning around veterinary work while Tegan sat here beside me?

"I've missed you, Michael," Tegan said softly.

"I've missed you too."

Hesitantly she leaned over to kiss me, and I kissed her back, dropping the veterinary-board envelope and not caring about it in the least. Tegan was here; she'd come back, she still loved me. And in this simple kiss there could be no possibility of miscommunication. No wrong signals sent, no unfounded assumptions . . .

Tegan's dog whined loudly, gave a firm tug on the lead, and yanked us apart.

"Sorry," Tegan said. "Mick's a bit nervous still."

"Oh," I said blankly. For the first time I wondered where the dog had come from. Tegan hadn't had one when she'd left.

"I found Mick on my way home. I saw someone dump him out of a car out in the desert, and I picked him up. Will it be all right if I bring him to work with me? I don't want to leave him alone."

"Of course," I said. Surely even the veterinary inspector could not object to the presence of a dog on our premises.

Gently Tegan drew the dog back up to her, and sat petting him, strangely intent. Ever so slowly Mick began to relax, and he settled at last with his head on her feet. "He's so frightened of everything," Tegan said quietly. "I wish I knew what else has happened to him, besides being dumped on the side of the road."

She looked up at me, and our eyes met for a long moment. She seemed to identify with this mistreated dog in some way, and I wondered just what had so overwhelmed her during this visit with her family. Just as I was about to ask, Tegan glanced down at Mick, and I followed her gaze. The dog was busily chewing apart my veterinary-board envelope. Tegan gasped, pulled it out of

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his mouth, and handed it to me. "Sorry. You'd better open that, hadn't you? It looks awfully official."

Serenely I opened the damp, mangled envelope, not really caring what the letter might say. What did it matter if I lost my license? I could easily find some other job—or perhaps I could just sell the clinic and live off the proceeds—or better yet, hire some new young veterinarian and retire to a managerial position—

"What does it say?" Tegan asked. "Your expression's gone very odd."

I reread the letter, then checked to make sure it really was addressed to me. "The board made an inspection yesterday," I told Tegan wonderingly. "It says I've passed. In fact, it says I've passed with a score of 'excellent.'"

"Well, of course," Tegan said matter-of-factly. "You always keep the clinic in good shape."

"But the inspector found all sorts of things wrong; she didn't have a good word to say about anything. She certainly didn't give the *impression* that she thought things were in good shape." I trailed off, still staring at the letter in wonder, while Mick very quietly pulled a roll of paper towels from the counter and began to chew on it. I was beginning to see why this dog had been abandoned on the roadside.

Tegan took the towels away from him and said, "Well, she is a state inspector. I suppose she finds that vets take her more seriously if she acts intimidating."

"It certainly worked on *me*," I said, reading the letter one more time just to convince myself that my license was actually safe. Apparently my retirement plans had been quite premature. But I still had trouble reconciling this letter with my memory of the inspection, which had seemed so very negative. Of course the veterinary board often sent mixed signals, such as the time they had mislaid the check I'd written for my license renewal, demanded another check, and then sent a refund along with a letter complaining about the extra paperwork involved when disorganized veterinarians foolishly sent in duplicate payments . . .

I put down the envelope carefully beside the microscope as an idea came to me. The more I thought about it, the more convinced I was that I had an answer at last. "Tegan," I said, "would you like to take a trip out to see the sea monsters?"

The drive to Howard and Lynda's ranch was heavenly, and all too short. Mick fell asleep in the back seat and Tegan and I talked as if we had been separated for years instead of weeks. When I asked for more details of her trip she grew very quiet, which troubled me, but we found plenty of other things to talk about. I told her about Mishka and the greyhound and Aaron, and she told one story after another about Mick.

When we got to the pool Howard and Lynda were waiting for us, somehow managing to look delighted and hideously worried at the same time. Their expressions reminded me strongly of the feelings I'd been picking up from Curious.

"We're so glad you're back!" Lynda cried, giving Tegan a hug. "And this is your new dog? Hello, Mick." She patted him, then turned to me. "Oh, Michael, I'm so glad you wanted to come tonight. We were just about to call you. Curious seems worse than ever."

Howard and Lynda led the way down to the pool's edge, and Tegan followed them with Mick at her heel. Her white dress, fluttering lightly in the breeze, was striking against the red and orange of the sunset. I followed behind the others, and reluctantly took my gaze away from Tegan so that I could examine my patient.

I was certain, at last, that I knew what was wrong, but I did one more examination to be sure. Curious whistled feebly at me as I checked him over, from his whiskery wrinkled snout to his four-pronged tail. Some of the other mon-

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sters swam into the shallows to greet me, then moved off again, peaceful and content.

"What did you find?" Howard asked anxiously.

"Nothing yet."

I took hold of Curious' fin, feeling the now-familiar surge of illness mixed with happiness. And now that I knew what to feel for, I detected a bit of low cunning as well. Firmly I grasped his fin and marshaled my own emotions. I would need a mix as complex as his, but it wouldn't really be difficult; it was exactly what I was feeling anyway. Pleasure to be with Curious, concern for his well being—and utter exasperation about the tricks he had been playing on me.

Curious squeaked dolefully and all traces of illness disappeared from the mix he was sending me. A certain sheepishness replaced it; he was obviously embarrassed at being found out. *Don't do it again, you little devil*, I thought firmly, hoping that some of that feeling was coming through. Curious looked woebegone; the fins along his back drooped and he gazed at me sadly. "Don't look so pitiful," I said with a laugh. "You're still my favorite. Now go and play."

Curious slid off the bank into the water, swam away vigorously, and leaped into the middle of the other monsters, making a huge splash that splattered us all with water. Immediately a vigorous game began, with Curious in the thick of it. Howard and Lynda stared at him, open-mouthed.

"What just happened?" Howard asked faintly.

"I let Curious know what I thought about him pretending to be sick."

"*Pretending?*"

"Yes, exactly. That's why it came and went. That's why all my tests were normal. But I can't really be too angry with him. He was doing it because he wanted me to come and visit."

"Of course," Lynda whispered. "Whenever he's sick or hurt, you come see him. Of *course*." Her voice rose. "But do you see what that means? Howard! Don't you see?"

Howard looked bewildered.

"It means I've been wasting my time, that's what it means! I'll bet anything that all the whistles and squeaks, all the *sounds* they make, don't mean much of anything. They're not just communicating their emotions by touch—by God, they can *lie* that way! It's got to be their real language; a language that's got nothing to do with sound at all—I can't believe I've spent so much time on a wild goose chase—" Lynda started pacing back and forth, muttering to herself. Howard turned to look at me.

"Are you sure, Michael? Curious is really all right?"

"I'm sure, Howard."

Howard still looked uncertain. "But he seemed so ill," he said.

"He couldn't have really been ill, though," Tegan remarked. "Remember how all the other monsters acted when he *was* sick? They hovered around him and almost acted as if they were ill themselves. They weren't doing anything like that today."

Howard, Lynda and I all stared at Tegan. She stared back at us, disconcerted. "What?" she said.

"Nothing," I mumbled. Why hadn't any of us noticed that? The other monsters had been telling us all along that Curious was fine, and we hadn't caught a word of it.

Tegan led Mick to the water's edge and knelt by a clump of wildflowers. "Want to see a sea monster, Mick? You pat the water, like this."

Mick gave her a puzzled look and then waded out to get a drink. Interested, a few of the monsters stopped their game and swam over to look at him. Curious hung back, apparently still abashed that he had been found out, but the littlest monster, Caterpillar, seemed particularly intrigued by Mick. The two touched noses, then hastily backed away from each other.

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Howard grinned. "Just like two little kids getting acquainted," he said. "Which reminds me—Lynda has some news." He turned to Lynda expectantly. Lynda, however, had a faraway look in her eyes.

"Of course," she said. "Of *course.*"

"Of course what?" Howard asked.

"I took Spanish class in high school, but I never could learn to roll my R's," Lynda said.

Howard and I looked at her blankly. I had a sudden, disturbing flashback to my conversation with Mr. and Mrs. Stone.

"But if I'd started when I was three, I'd be able to," Lynda went on. "Little children can pick up nuances of languages that adults can never get."

"Oh," Howard said. "Oh, my. You think our baby might be able to learn the monsters' language?"

Lynda shrugged. "Maybe," she said.

"Baby?" I said blankly. "What baby?"

"Mine, you idiot," she said. "I'm pregnant."

We spent the rest of the evening relaxing by the pool. Mick seemed fascinated with the monsters, and they with him, and there was a constant back-and-forth of play as they touched noses and whistled and barked. I felt a purely delightful sense of peace settle over me. Oh, what a wonderful change this was from yesterday. Now, all was right with the world. The monsters were fine, my license was safe, and Tegan was at long last home. I watched her play with Mick and Caterpillar, a vision of beauty in her white dress, and thought how blissful it would be to stay in this moment forever.

Then my pager went off, and the moment was gone. I sighed, pulled out my phone, and made the return call.

"Oh, hello, Dr. Clayton, this is Mrs. Green. I'm so sorry to bother you, but there's a problem with Alley. You do remember Alley, don't you?"

Little Alley, the cat with both vulva and testicles—I wasn't likely to forget her. Or him. Nervously I said, "What is the problem, Mrs. Green?" Oh, God, I'd spent over an hour puddling around in that cat's abdomen . . . what if I'd contaminated something? Caused a peritonitis? A hideous thing in a cat, frequently fatal, and I shouldn't have been in the abdomen at all.

"Well, you know how you told us to keep an eye on her incision? To watch her for licking?"

"Yes, yes . . ."

"Well, she's been licking the incision all evening, and most of the sutures are gone now, so we were concerned."

"You—you've been *watching* her do that?"

"Yes, just as you said."

"But you were supposed to *stop* her! Stop her from licking!"

There was a short, offended silence. Then Mrs. Green said, "That isn't what you *said* to do. You said to watch her."

As I put my phone away, shaking my head in disbelief, Tegan scrambled back up from the poolside, Mick in tow.

"What is it?" Tegan asked. "Do you have an emergency?"

"Apparently."

"What is it?"

I thought for a moment. "A victim of miscommunication," I said at last. My annual continuing-education course was coming up soon; might there be any seminars on client communication? Language lessons tended to be sadly absent from most veterinary curricula, but I could always hope.

Tegan looked at me quizzically. "That's not very specific."

"Oh, sorry. Cat licked her sutures out. His sutures, that is. Ready to go?"

"Sure. Sutures from what?"

"A spay."

"You're saying *he* licked his *spay* sutures out?" Tegan eyed me warily.

"Yes, exactly."

"Ah," Tegan said. "I see where the miscommunication comes in."

I told her the story on the way home, which she appreciated enormously. Oh, it was good to be back with Tegan. The

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feeling of well-being that had been interrupted by my pager came back full force, and I was utterly content.

Almost content, anyway. I was definitely going to have to start communicating better with my clients. I resolved to start tomorrow: I would be clear and concise and very, very specific, and I would not have any more inadvertent emergencies like this one.

The next morning I entered the clinic whistling. Tegan was there, efficiently seeing to the animal care and directing Aaron's cleaning efforts. Mick was in the break room, curled up on the couch. Everything was just as it should be, and I picked up my first file, ready to start my new program of clear communication.

The first client was Mr. Sandoval, who brought in a fine young boxer pup and lifted him on to the table. "Mugsy's here for his booster shots, Dr. Clayton," he said cheerfully.

I patted Mugsy and performed a quick examination. His heart and lungs sounded quite normal, but his temperature was very slightly elevated.

"Has Mugsy had any problems, Mr. Sandoval? Has he been sick at all?"

"Oh no, he's been fine. No problems at all."

"No diarrhea or vomiting? Coughing or sneezing?"

"No, no, nothing like that."

"Is he eating all right?"

"Yes, yes." Mr. Sandoval was beginning to sound impatient, but I wanted to make sure that I checked specifically for any possible problem.

"How has his energy level been? Has he been playing as much as usual?"

"*Yes*. He's been fine." Mr. Sandoval was definitely getting exasperated.

I considered Mugsy thoughtfully. He certainly appeared to be in excellent condition, and it was not uncommon for a healthy animal to show a mild elevation in temperature simply from the excitement of the veterinary visit. And Mr. Sandoval had clearly communicated that the pup was showing no sign of illness. It ought to be quite safe to administer the vaccine.

Mugsy scarcely seemed to notice the needle, and Mr. Sandoval picked him up and set him on the floor. "Thank you, doctor," he said.

"No problem. I'll see you next time."

Mr. Sandoval opened the exam room door and started to go out, then stopped abruptly. "Oh, by the way," he said. "There's one thing I meant to ask. Mugsy's been vomiting for the past couple of days—should I be concerned?" ■

(EDITOR'S NOTE: Michael and the monsters have appeared previously in "Little Monsters" [November 1989], "Business as Usual" [July 1991], "Strange Things" [June 1992], "Yellow and Orange Blues" [May 1998], "As Time Goes By" [July/August 1999], and "Sea Changes" [April 2002].)

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Science Fact

The Wired Ocean: Doing Oceanography Without Getting All Wet

Richard A. Lovett

On high-resolution sonar images, dolphins look like fish in a shooting gallery. They have the unmistakable silhouette of fins and flippers, but with bright yellow bulls-eyes in the front part of their bodies.

One reason why dolphins make excellent acoustical targets is that they're large, Kelly Benoit-Bird, a postdoctoral fellow from the Hawaii Institute of Marine Biology, was telling an attentive audience of ocean scientists.[1] But mostly, it's because their blubber conducts sound very differently from either seawater or the not-so-fatty flesh of fish. The distinctive boundary between skin, blubber, and ocean provides a reflecting surface that shows up brightly when pinged from sonar arrays positioned on the sea floor or towed behind a researcher's ship. Even better targets are the dolphins' lungs, which appear as bright air bubbles, color-coded yellow by the image-enhancement software Benoit-Bird was employing to display the images.

Benoit-Bird had used her sonar array to watch the dolphins hunting a school of fish. She then presented that data as a computerized movie that compressed a

[1] Most of the research discussed in this article was presented at the 2004 Ocean Sciences meeting of the American Geophysical Union. Abstracts are available online at www.agu.org.

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five-minute hunt into about twenty seconds. The hunt began with about eighteen dolphins approaching the fish in line-abreast formation, like soldiers in a skirmish line. (Fish schools also show on acoustical images, typically as fuzzy patches that look like acoustical snow.) The dolphins, guided by their own sonar, zeroed in on the fish, then fanned out to circle them, herding the frightened fish into an ever-tighter cluster. Only then did the dolphins begin feeding, diving into the school of fish in twos, one from each side of the circle, each taking its turn while the others kept the fish tightly herded. Eventually, the dolphins ran out of air and surfaced, while the remaining fish made their escape.

There's nothing earthshaking about the dolphin research itself. We've long known that dolphins are intelligent creatures capable of working in highly organized groups. What is startling is the quality of the remote sensing that produced such stunning graphics. The next step—already under way—is to put such data online as it is obtained. This will allow scientists and interested members of the public to monitor the ocean in real time, sharing data and improving the quality of everything from weather reports to marine species conservation.

Classical oceanography is done with ships and submersibles. Partly that's because ocean scientists, like geologists, ecologists, archaeologists, and many other types of outdoor researchers, enjoy getting out into the field. An oceanographer who's afraid of the water might make a great fictional character, but in real life, such people are rare.

But this hand-on approach means that, historically, ocean research has been an extremely hit-and-miss science. The oceans are enormous, and even our best studies have too often been equivalent to a space explorer trying to figure out a planet's ecology by grabbing isolated plants and animals at 100-mile intervals. The future belongs to the wired ocean.

Some ocean observatories are already putting real-time undersea data online. One, in New Jersey, has a web site that sometimes draws thousands of hits per day, says Oscar Shofield, an associate professor at Rutgers University.[2] Who's generating all that traffic? New Yorkers trying to decide whether it's a good time for a beach outing or fishing trip. "They check at lunch or after dinner to plan tomorrow's activities," Shofield says.

Shofield is thrilled that his data collecting can serve double duty. But not all uses of online data are benign. If marine animals are equipped with electronic collars that allow their migrations to be tracked by satellite (already being done for some species), what's to stop poachers from using the same data to zero in on, e.g., endangered sea turtles? And what about legitimate fishermen? Could they use dolphin-tracking data to let the dolphins lead them to the fish? Efficient fishing is good. Over-fishing isn't.

Still, the wired ocean's promise is too great to be ignored. Let's explore just a few of the things that are already possible.

The View from Space

One of my interests is whitewater rafting. Anyone who's ever stood by a major rapids knows that it's a maelstrom of waveforms that often seem to defy gravity. When current encounters a rock (or a gravel bar jutting out from shore), it forms a "pillow" behind it, as the water piles up, seeking a way around the obstacle. Below the rock is the reverse—a "hole" where the suction of the passing water has lowered the surface elevation (sometimes quite dramatically). Elsewhere, water reflects off of cliffs to produce diagonal standing waves that angle into the river, never changing location. Or the water dives under the cliffs (very dangerous for boaters), only to return to the surface downstream as a surface-elevating "boil" that looks like what the name implies. Even relatively calm rivers

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contain the same features, although you may need a practiced eye to notice them. Easier to spot are eddies, where the water swirls in whirlpool-like formations along the edges of a major current, or flows upstream in a never-ending effort to fill in a hole or flatten out a boil.

Ocean currents create the same features, albeit on a vastly larger scale. Downwelling waters in the arctic and antarctic create holes; upwelling waters in the tropics create boils. Enormous eddies can be formed down-current of islands or peninsulas, or far out to sea by colliding currents. In the Gulf of Mexico, for example, Cuba and Florida conspire to create an enormous loop eddy that branches away from the main current circulating in the Gulf.

From space, all of these show up as bulges or depressions in the average sea level. The bump or dip might be 100 miles across and only a few inches high, but that's not too small to be seen by the satellites' hypersensitive laser altimeters. Eddies also show up as changes in surface-water temperature, measured by orbiting infrared cameras or microwave sensors. In addition, growing conditions for plankton (such as the nutrient content of the water) may be different within eddies, causing them to show up differently on satellite instruments tuned to measure the "greenness" of chlorophyll. Even satellites designed primarily to study land surfaces spend two-thirds of their time over the ocean, so their users have found a variety of ways to extract oceanographic data from them.[3]

One of the most interesting satellite applications has been the ability to measure surface wind speed from space. The process is a byproduct of the laser altimetry used to seek out eddies.

On the oceans, altimetry is complicated by the fact that the sea's surface is rough. If you're looking for a 20-centimeter change in average sea level between the inside and outside of an eddy, the first thing you have to do is some fancy signal processing to average out the effect of waves. In the process, you find that the surface of the ocean has two basic types of waves: big ones and little ones. The big ones are the swells that we all know from watching surf break on the coast. The little ones are wind chop, superimposed on the swells. Swells travel long distances across the ocean, but chop reflects local wind conditions.

On downward-looking radar, both of these look like nothing more than noise, obscuring the primary signal being used in the search for eddies, upwellings, and current bulges. But suppose you aim the radar beam at an angle, rather than straight down. On a perfectly calm sea, the signal would bounce away at an angle and you'd see no return echo. But if there's a lot of chop (which produces steep-sided waves, rather than the gentle contours of swells) some of that signal is going to bounce back to you. The more wind, the bigger and steeper the chop, and the stronger the return ("scattered") signal.

That's the theory behind the SeaWinds Scatterometer. First tested in 1999, this satellite instrument parses through the radar scatter to plot wind speed across the entire ocean to a resolution of about 25 kilometers. With a finer, 2.5-km resolution, focused on a single area, it's even possible to locate the calm eye of a typhoon more accurately

[2] The web site is (http://marine.rutgers.edu/cool/). COOL is the "Coastal Ocean Observation Lab."

[3] There are also military applications. During the Iraq War, satellite images were used to determine whether waters had enough visibility to allow skin-divers to search for Iraqi mines, says Ken Matulewski, of the Naval Oceanographic Office at the Stennis Space Center, in southern Mississippi.

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than can be done with simple photographs, says David Long, of Brigham Young University.[4] At this scale, there's too much noise in the signal for precise measures of wind speed, but if all you're looking for is the eye of a hurricane, the difference between enormous winds and none is easy to spot.

Measuring wind from space is of obvious value for weather forecasting. Eddy watching is of less obvious practical use, but it can be linked to studies of algal and plankton growth (themselves measured from space by observing changes in water color) or of whale migration and foraging, to see how eddies affect ocean ecology, and ultimately to make ecological predictions that might lead, e.g., to better fishing regulations. It's also possible to create eddy maps (and forecasts). Commercially, these are useful for such facilities as offshore drilling platforms, for which as little as a one-knot current can create difficulties for some operations. Remote sensing data can also be used to predict toxic algal blooms in places such as Australia, where shellfish concentrate algal toxins and sicken shellfish consumers. The wind, water temperature, and nutrient conditions that produce such blooms are fairly well understood. What's lacking is the monitoring network needed to predict them far enough in advance.

A more exotic application is a pilot project called High Seas GhostNet, which has all the trappings of a Golden Age science fiction story.

GhostNet[5] proposes to use a battery of high-tech methods to attack a persistent environmental problem: drift nets in the Pacific Ocean. Up to 30 miles long, these nets are big enough to drown a whale. They can also damage coral reefs. For these reasons, they have been banned for years, but abandoned (or lost) nets are still out there, wreaking havoc on birds, sea turtles, and marine mammals. Of the 1,500 Hawaiian monk seals still living in the wild, for example, it has been estimated that 50 per year are killed by abandoned drift nets.

The GhostNet program proposes to track down these nets before they hit land (or whales). (The same methods can also be used to find other dangerous items washed or thrown overboard from boats of all types.) The program is based on the simple hypothesis that drifting objects are likely to wind up trapped in eddies, says Timothy Veenstra, a pilot from Wasilla, Alaska. Find the eddies, and you find the junk.

Using the satellite tools discussed above, Veenstra obtained a grant from NASA and recruited the Coast Guard to help him see how well it worked. Unfortunately, in the wake of the 9/11 terrorist attacks, the Coast Guard withdrew to focus on national security, and Veenstra had to scale down his project. Using satellite data, he mapped eddies in the Gulf of Alaska, then, instead of investigating by ship, he flew across them in an equipment-laden plane to see what they might have trapped. The plane contained surface-penetrating radar and infrared sensors sensitive enough to spot the cold water brought to the surface by the flukes of migrating whales. Sophisticated software set off an alarm whenever an anomaly was detected—whether it was a log or a school of salmon. Initially, he'd hoped to find at least one large drift net. Instead, he had to content himself with proving that debris indeed fetched up where the GhostNet model predicted. Perhaps it was just as good that none of the ocean junk he observed was a net: without a boat, he had no way to remove it, anyway.

Another way to find floating junk is by using Doppler radar. These instruments, which function similarly to the

[4] More information on SeaWinds, including recent wind-speed maps, can be found at http://winds.jpl.nasa.gov.

[5] See www.highseasghost.net.

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speed detectors used by highway cops, are mounted on shore, and are precise enough to measure ocean currents moving only a mile or two per hour. Their primary limitation is that they need direct line-of-sight. Anything that's far enough out to sea that it's below the curvature of the Earth is invisible to them.

Such a Doppler radar network already blankets much of America's Northeast coastline, where it maps currents, hour by hour. Ocean scientists love the ability this gives them to study how currents interact with each other, as well as with the weather and ocean floor terrain, says Schofield, whose website draws so much attention from beachgoers. But search-and-rescue officials also like it because, if a boat goes missing or a swimmer is pulled out to sea by a rip tide, it takes a lot of the guesswork out of trying to figure out where to send the rescue crews.

Listen Carefully

Another line of research is acoustics. We've already seen how high-resolution sonar can be used to spy on dolphins. But that's just the beginning of what's possible. Sonar pinging can also be used to study zooplankton (different types of which reflect sound differently), fish, kelp, clams, and squid. It helps, of course, to know in advance whether you're looking for krill or kelp. Then, by pinging your target in four or five different frequencies, it's possible to distinguish individual types of creatures by size, shape (cylindrical vs. round), and constituency (squishy, crunchy, or containing an air bubble). By listening carefully, it's becoming increasingly possible to calculate the biomass of each type of sonar target in the water beneath you, compiling the data into an ecological map of the subsurface.

Sonar "pinging" employs "active" hydroacoustics, in which you create a sound and bounce it off your target. Another technique is "passive" hydroacoustics, in which you simply put out a hydrophone and listen to whatever is in the vicinity: whale songs, lava steaming from undersea volcanoes, the hiss of wind, the pitter-patter of rainfall.

The latter two turn out to be among the most interesting.

Rain is one of the loudest things normally heard underwater. A submerged hydrophone can reveal not only the size of the drops, but the rate at which they are falling, says acoustic rain gauge designer Jeffrey Nystuen of the University of Washington. Heavy rain, obviously, is louder than light rain. Big drops ring like a bell at a frequency of about 3 kHz, while drizzle sizzles at the upper end of human hearing, at a frequency of about 21 kHz.

Each hydrophone measures what's happening on the surface over a circle whose diameter is about three times as large as the depth at which the sensor is located. In other words, a hydrophone tethered 200 meters below the surface will reveal what's happening in a circle about 600 meters in diameter; while one tethered 1,000 meters below the surface will reveal conditions in a circle five times as wide. By planting hydrophones at a variety of depths on the mooring line of a single buoy, it's possible to distinguish local showers from more general rainfall patterns.

Pilot tests have indicated that acoustic rain gauges are more accurate than satellite measures of rainfall, which have the drawback that the satellite only passes overhead a few times a day, and can miss intermittent showers. Also, acoustic gauges aren't subject to the problems that afflict surface rain gauges (affixed to buoys), which may be measuring windblown spray in addition to rain.

The main limitation to hydrophonic rain gauges is that if there's a lot of wind, the wind noise may mask the sound of the rainfall, effectively jamming the sensor.

On the other hand, if the rain isn't too

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loud, the same hydrophones can also measure wind speed by listening to the hiss of air bubbles blown into the surface water by the wind. The intensity of this sound is roughly related to the energy of the wind, which is proportional to the cube of the wind speed. It's an empirical measure, however; for some unknown reason, the sound rises a bit more steeply than the energy—at roughly the 3.4^{th} power.

It has been known since the 1960s that this relation holds for velocities between 10 and 40 mph. (At velocities below 10 mph, the wind doesn't have sufficient energy to drive air bubbles into the water, and there is no telltale hiss.) But until recently, nobody knew what happened at higher speeds. Then, in 1999, Hurricane Gert passed almost directly over a seismologist's hydrophone on the Midatlantic Ridge.

Hurricanes are among the most devastating storms known to humanity, but despite all the attention lavished on them, they continue to defy forecasters. One of the difficulties is getting a good measure of wind speed. Airplane overflights are accurate, but too expensive for poor, hurricane-vulnerable nations such as Bangladesh. (The planes alone cost $30 million to $40 million, not counting the costs of flying them). Satellite measures are cheap, but become inexact at hurricane-level wind speeds, producing errors as large as forty percent, says Nicholas Makris of Massachusetts Institute of Technology.

Several years after Gert's close encounter with the seismologist's hydrophone, Makris learned of it and compared the hydrophone readings to wind speed readings obtained by an airplane overflight of the same storm within a day of the hydrophone readings.[6] By carefully plotting the track of the storm, and comparing the hydrophone's record to wind speeds measured at varying distances from the hurricane's center, Makris was able to correlate wind noise and wind speed in the vicinity of the hydrophone as the storm approached, then receded. He found that even at hurricane intensities, underwater noise is proportional to the 3.36^{th} power of the wind speed, with an error of only 5 percent.

Unfortunately, as we mentioned earlier, hydrophone measures of the weather reveal only what's going on directly above the instrument. So, if a hurricane passes too far away, you only learn what's happening on its periphery.

This, however, opens the door for an interesting variation on the ever-popular storm-chasing science fiction story, of which *Analog* has seen its share.

Hydrophones are a lot cheaper than hurricane-equipped airplanes, but they still cost about $10,000 each, so you can't carpet the seas with them. But for the cost of a single hurricane-chasing airplane, you could put out 3,000 of them. That's enough to set up ten 3,000-mile-long picket lines across the North Atlantic, if you positioned the devices ten miles apart. That's a lot of weather reporting stations. The question now becomes their operational life: how often would you have to spend another $30 million to replace them all?

If budget constraints only allow a few hydrophones, your options are more limited. You either need to (a) get lucky, as happened with Hurricane Gert and the seismologist's hydrophone (not a particularly interesting story, since it's now been done in real life), or (b) position a hydrophone right in the path of the storm, so the eyewall passes directly over it.[7] In the latter case, there would be the opportunity for a story about the

[6] The timing of the airplane overflight wasn't perfect, but sometimes in science, you make do with what you have. Luckily, the storm didn't appear to have changed intensity in the interval between the hydrophone readings and the airplane overflight.

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brave hurricane forecaster attempting to prove up this system as he risks his life, deploying hydrophones ahead of an approaching storm. The closer he gets to it, the fewer instruments he needs, but the harder (and riskier) the task becomes. We've seen that type of story before, but the world can always use another.

Moaning at Whales

Acoustics can also be used to map ocean temperatures in a way that's impossible from space. The technique is based on the simple fact that the speed of sound in the ocean varies with the water temperature. The effect isn't huge—only a few tens of milliseconds on the hour-long journey across a big chunk of the Pacific—but it is detectable, and Brian Dushaw of the Applied Physics Laboratory at the University of Washington has already conducted pilot studies on a device like an undersea foghorn that beams sounds from California to Hawaii.

A single transmitter and receiver gives you the average water temperature along one path: not terribly useful for mapping. But if you place a network of transmitters and receivers around the globe and crisscross the oceans with sound, you can map their temperatures to any degree of resolution you want.

We can, of course, already take the ocean's temperature more directly from space, using satellites that measure infrared or microwave emissions. But these reveal only the water's surface temperature. Knowing what's going on below has implications for weather forecasting: a thin layer of warm water can easily vanish if winds or currents disperse it into underlying colder waters. It's also relevant to global warming. The oceans represent a huge heat sink that slows the pace of climate change. If their deeper waters are warming up, even slightly, that has tremendous implications for the future.

Rather than being limited to the surface, speed-of-sound measurements give us an average water temperature to a depth of about 1,000 meters. That's because the ocean acts as an acoustical waveguide down to the depth of the deep-water thermocline—a sudden change in water density that marks the boundary between the deep ocean and the really, really deep ocean. Between that boundary and the surface, sound waves bounce back and forth as they travel, like light in a fiber optic cable, effectively giving an average temperature for the top 1,000 meters of the ocean.

Other than cost and the time-consuming project of calibrating the mapping software (a task I am *very* happy not to have to do!), the primary downside to using speed of sound to measure ocean temperatures is its potential impact on whales and other marine mammals.

The signals used for these measures are chosen to be an octave or two removed from the frequencies generally used by large whales. But the emitters have to be loud enough to be heard from thousands of miles away, and for long-distance propagation, the sounds need to be in the low-frequency zone also used by whales. Whales communicate variously at 10 to 20 Hz and 200 Hz. The transmitters tested by Dushaw work on an intermediate frequency of 75 Hz. But will the foghorns deafen the whales, disorient their migrations, or otherwise drive them batty? Dushaw's six-year study found "no significant biological impact," but whale advocates are not yet convinced. Nobody wants to wake up one morning and discover that we have accidentally persuaded the Pacific gray whales to reverse course and start migrating to Baja in the summer and

[7] A near miss probably works, too, if you have a precise measure of the eye's location and a formula for the drop-off of wind speed with distance from the center.

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Alaska in the winter!

Wildlife Revisited

Earlier, we talked about tagging sea turtles with transmitters that up-link directly to satellites whenever the turtles are on the surface. Such devices aren't fiction. It's now possible to satellite tag wildlife with transmitters small enough that they don't even impede the flight of birds. By tagging one individual per pod of elephant seals, for example,you can watch the migration of multiple pods as they follow each other around the ocean like cars on a train or one of those old-fashioned "centipede" computer games. The next step is to overlay this on satellite images of changing ocean conditions to see how the animals react to currents, eddies, plankton blooms, surface temperature, etc.

But perhaps the most interesting use is one that has already been done with a satellite-tagged albatross by Daniel Costa, of the University of California, Santa Cruz.

It's long been known that these birds wander all over the Pacific Ocean. Costa's brainstorm was to overlay the bird's flight path on a day-by-day wind map, generated by SeaWinds or some similar instrument. The result, presented as a computer movie at the 2004 Ocean Science meeting of the American Geophysical Union, was stunning. The bird not only took advantage of whatever winds it encountered, but it seemed to know the prevailing wind patterns of the Pacific, detouring out of its way, for example, to get a boost from the winds swirling around the Hawaiian Islands.

Here, of course, is where the ecological controversy applies. Albatrosses are looking for fish, so fishermen tapping into the satellite feed can use the birds as guides. Similarly, leatherback turtles, of which only 1,000 exist in the world, are also being satellite tagged. Posting their locations on the Internet would help people keep from accidentally interfering with them. But everyone from tourists to poachers could use the same information for the wrong purposes. Scientists such as Costa are still debating the pros and cons of making such information public.

Ultimately, private enterprise may supplant the best efforts of many biologists. It may be possible to keep secret the locations of rare species. But anyone can catch an albatross, and satellite tags are sure to become ever-cheaper and more reliable. If the flight patterns of albatrosses or the fishing patrols of dolphins are really of commercial value, there's a market niche for some entrepreneur to tag a few of the animals and dole out the information to Internet subscribers. And there's not much the scientific community can do to stop it.

Networking the Ocean

Fascinating as they are individually, SeaWinds, eddy hunting, wildlife tagging, and acoustics are merely pieces of ocean scientists' long-term dream: the ocean observatory.

Three types of observatories are on the designing table: regional, coastal, and global. Regional observatories would put interconnected arrays of instruments into a sizeable chunk of ocean, preferably one that has already been well studied, such as the San Juan de Fuca trench offshore from Washington and British Columbia.[8] Instruments will be connected by hundreds of miles of fiber-optic cable that can not only carry data back to the scientists, but will also allow them to reprogram their instruments as needed, much as is now done with Mars rovers. Satellite uplinks via buoys might incorporate outlying instruments into the array without the need of additional cable. One of the biggest costs would be the cable, but in

[8] This project is Project Neptune. For maps and details, see www.neptune.washington.edu.

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some cases it may be possible to piggyback onto existing telecommunications equipment. One plan to study undersea volcanoes in the Pacific would use a decommissioned AT&T cable running from Guam to the Philippines as its fiber-optic backbone.

Coastal observatories are smaller, and exist today. Typically they're comprised of strings of cable-linked subsurface instruments extending a few miles offshore.

The real dream is the global ocean observatory in which everything is linked via satellite, and instruments are numerous enough that scientists can study the ocean in its entirety. Cable is too expensive to string everywhere, so this will have to be largely a wireless system, although existing regional and coastal observatories would certainly be incorporated into it. Additional features might include the following:

• *Gliders*. These would be fleets of robotic vehicles that could remain at sea for months at a time. They'd spend most of their time exploring the depths, surfacing periodically to beam data to a satellite. They aren't cheap, costing about $50,000 each, but neither are conventional oceanographic vessels, and you can build several gliders for the cost of a month-long boat trip. Their mobility and ease of deployment will make them an important component of the global ocean observatory.

• *Undersea cell phones*. This isn't quite as far out as it sounds. Rather than functioning by microwave, like conventional cell phones, it would be an acoustic system. Bandwidth would be a problem at acoustic frequencies, but skin-divers have functioned for years on the even more limited "bandwidth" of hand signals, and even limited underwater wireless service is a lot better than nothing. If capacity constraints become a problem, perhaps undersea cell phone time will wind up being parceled out far in advance, like research time at astronomical observatories.

• *Underwater GPS*. The traditional global positioning system is a satellite-based network that won't work underwater. But something similar is possible using hydroacoustics. Most people think GPS works by triangulating on satellites that are sending out homing beacons, but actually it is based on clocks, with each satellite sending out an extremely precise timing signal that is picked up by the receiver. By comparing the speed-of-light delays from several signals, the receiver figures out precisely where it is in three-dimensional space. The conventional GPS system can give you your position in all three dimensions to within a centimeter. The goal is to match that underwater by sending out time signals via hydroacoustic beacons. If the desired accuracy can be attained, it would allow ocean scientists to measure sea-floor movements and plate tectonics with the same precision now used on land. One potential hitch comes from the fact, discussed earlier, that the speed of sound in water varies with temperature. The effect turns out to be enough to throw off your location by several meters if you're dealing with beacons located at shore stations thousands of miles away. One way to mini-

[9] Similar problems with atmospheric turbulence are the limiting factor to the accuracy of conventional GPS. To obtain centimeter accuracy on the surface, you need to employ an arsenal of data-processing techniques (generally involving multiple receivers) to account for these effects. Other than a computer, this doesn't take special equipment, but you do need to leave the GPS receivers stationary for an hour. Basically, the longer they stay in place, the more accurately they know where they are, until they bump into the system's inherent centimeter-scale limitations.

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mize it is by increasing the number of beacons to reduce the signal path length. Another is by using computer algorithms that factor water temperature maps into the calculation.[9]

The wired ocean won't come into being without numerous glitches. As one researcher colorfully puts it: "Anytime you put electronics in salt water, it's an adventure." Not only do instruments often malfunction, there's always the risk that some fishing trawler will accidentally snag your $100,000 instrument package and not bother to give it back. Researchers have learned the hard way that it pays to build equipment with as few projecting surfaces as possible, so it's harder to net.

Nevertheless, the wired ocean will mostly be using mature technologies—particularly in the acoustic realm.

As anyone who's ever read a Tom Clancy novel knows, hydroacoustics were developed to a fine art during the Cold War, when U.S. and Soviet submarines tracked each other around the globe in a high-stakes game of hide-and-seek. Today's interest in the same technology is a classic example of one person's garbage being another's treasure. The Navy spent years trying to figure out how to pick out submarine sounds from the background of rain squalls, whales, seismic events, and icebergs grinding on the sea floor. To them, all of these were merely noise that interfered with the critical question of "where did that sub go?"

Ocean scientists now face the reverse problem. Their signal is the Navy's noise—and some of the things the Navy paid attention to are the ones they're most interested in filtering out. After all, if you're trying to triangulate on a pod of migrating whales, the propeller noise of a destroyer passing overhead is a major nuisance.

But imagine the embarrassment (not to mention international backlash) if an oddly behaving whale turns out to be somebody's (supposedly) superstealthed sub. Alternatively, there have been plenty of science fiction stories in which human visitors to alien worlds, and alien visitors to Earth, have skulked around the ocean, believing themselves safe from prying eyes. Maybe someday an ocean scientist will be the one who accidentally makes first contact, when some interfering noise turns out to be something quite unexpected.■

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The Doctrine of Noncontact

Catherine Shaffer

Illustration by A.C. Farley

How far should dedication to an ideal go?

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Michaela took a beacon the size of a thumb tack from her hip pouch and pressed it into the bark of a tree. It immediately camouflaged itself and became invisible. "Only a thousand more," she muttered with a sigh, then turned to press onward through the jungle.

Michaela's feet ached as her arm swung mechanically, hacking at the vegetation with a machete. The men marched behind, silent except for an occasional grunt.

She scanned the forest, alert for signs of life—intelligent life. As insignificant as a bent twig, or as large as a village complete with stone huts. Her mission was simple. *Do not make contact.* At the first sign of inhabitants, she must turn away, and lead the expedition wide around them. It was more complicated than that, of course. But Michaela enjoyed the idea of a negative mission. She'd traveled hundreds of light years specifically *not* to meet the life forms that made their homes in this forest. It tickled her intellectually.

"Take a break here, chief?" said one of the men.

Michaela wanted a break so badly she almost fell down at the mere suggestion. *Take another goddamned step*, she ordered her feet. And they did. "Three more kilometers," she answered in a chipper voice. "Then we'll make camp."

All of the humans in her expedition were male. Leading an all-male expedition through the jungle wasn't the easiest thing for a sixty-year-old grandmother to do. With women, it would have been easy. She need only convince them that it was the smartest, most reasonable thing to do to listen to her and follow her orders. Then the largest girl would carry the largest pack, and everyone else would perform duties according to their strengths and talents. But with men, you had to show them you were tougher and stronger right from the start. If she carried any less, if she didn't walk out front, bushwhacking, if she didn't make an example of the first troublemaker who smirked when he should have been saying, "Yes, ma'am," then she knew there'd be mutiny before the end. The Ypsithra, of course, were completely different.

Michaela gritted her teeth against the pain and thought about Sacajawea, who led Lewis and Clark up the Missouri river, cooking, paddling, guiding, all while carrying her newborn infant. She could do this. She would do it. She was starting to hate the jungle.

There was a sudden shout from the back of their column. The Ypsithra bearers scattered, chittering. A couple of the men had their rifles up to their shoulders, scanning the jungle. Michaela made her way back to them. "What happened?" she said.

One of the men pointed at a spear sticking out of the ground. It was tipped with a stone projectile point. Very primitive. *Good*, thought Michaela. "If you see them," she said, "Shoot to kill."

The three kilometers finally passed, and Michaela called a halt. Normally, there would have been a buzz of happy conversation at this point, but the atmosphere was tense and silent. Michaela kept her pack on for a minute while the men collapsed, squinting through the trees, as if she really wanted to walk another five or ten kilometers, but didn't want to tire her boys. When she felt she had made her point, she eased the pack off and set it gently on the ground, then casually rolled her shoulders and took a deep breath.

The expedition numbered twenty-five. Ten boys from the university, seven young Ypsithra laborers, and eight Ypsithra soldiers. The Ypsithra had been the dominant species on the planet, before contact with galactic civilization. They were squat-bodied and vaguely mammalian, with six legs and rows of sensitive feeler-hairs down each leg that had evolved for hunting insects. The Ypsithra never complained about heavy packs and long walks. The laborers were de-

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lighted to be earning high wages in off-world currencies, carrying packs, cooking, making and breaking camp. The soldiers were a little more reserved and less enthusiastic about the mission, which they didn't understand. But they were reliable and obedient.

Michaela sat down on a mossy stump to chew on a piece of jerky. One of the boys came and sat down next to her. It was Robin, a second-year graduate student. As students go, Michaela judged him adequate. Graduate students were just warm bodies to keep the lights on in the lab at night, as far as she was concerned. When they started publishing papers and getting a lot of attention and correspondence from the field of xenology, she graduated them, and broke in a new set.

"Water?" said Robin. Back at the university, Robin had been a bookish young man. Pale, with a spare tire around his middle. Thick spectacles, and no facial hair, with a wide, open expression and a quick, shy smile. They'd been on the planet Maht for a month, and Michaela had to admit he was shaping up nicely. New muscles rippled beneath the freckled skin on his arms, and a belt held up pants that were now two sizes too big. If she'd been thirty years younger—she stopped the train of thought with a grimace. Take off thirty years, and she'd *still* be too old for him.

Michaela grunted and took the flask from him. She drank it down to nothing, even though she wasn't very thirsty. Dehydration was no joke in the jungle. "Thanks," she said.

"Was that really them, back there?" said Robin.

"I expect it was," Michaela answered. "It just means we need to cut to the east. We must be getting too close to a village."

"But you said to shoot to kill? Why not just fire over their heads, frighten them away?"

"Shooting into the air would scare them, but might also excite their curiosity. I want them to really hate us."

Robin gave Michaela a look of pure disgust. "You're talking about murder."

"Believe it or not, I'm trying to save their lives. A million Ypsithra died when we made contact with them. A couple of natives dead here are a small price to pay to protect the entire population, and to preserve their culture."

Robin shook his head. She could see that no matter what she said, he wasn't going to believe her. His body may have hardened in the jungle, but between the ears he was still soft. "I can't believe we're coming all the way out here, and we're never even going to see them. Given the right antibiotics—"

"You remind me of my nephew," Michaela said.

Robin smiled slightly.

"He's six years old."

Robin sighed and looked away. "There's so much we could learn. We don't even know what they look like."

"They probably look a lot like the Ypsithra," said Michaela. "It's unlikely that two completely different intelligent species could have evolved side by side on the same planet. They're probably cousins, of sorts. Possibly even sibling species, like horses and donkeys."

"But how do they live, how do they breed, what do they eat? We don't know anything. Are they matriarchal, like the Ypsithra? Do they hunt or fish? Or both?"

Michaela blinked at Robin. So hungry, these young men. Can't wait to discover something new and get themselves published in *Xenology Review*. She shook her head. "Some things are more important than knowledge, Robin. Have they asked us to come in and destroy their way of life?"

"Have they asked us not to?" said Robin. "We could bring medicines for their children, and food. And weapons. How many of them are killed by predators? I think they would be grateful. And what about *their* knowledge and *their* curiosity?"

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"Not as many children are eaten by predators as would be killed by another *E. coli* outbreak. And as for *their* thirst for scientific knowledge, let it drive *them* out of the jungle and across the sea where they will find us. Maybe then they will be ready for contact."

Robin clasped his hands and looked at the ground. Then he got up and walked away. Michaela sighed and rolled her aching shoulders once more. She knew how he felt. She had made first contact with twelve different species, including the Ypsithra. Each time, it was like the first time all over again. There was the excitement of reaching out to the unknown, of finding a common basis for communication, of making the first overtures of friendship. And beneath it all, the persistent fear that *this time* it would all go wrong and the natives would kill her and eat her for breakfast. It seemed cruel to take all of that away from the young people, the budding xenologists who dreamed of following in her footsteps and bringing new cultures and new people into the Galactic Confederacy.

But Michaela's experience had brought to light a bitter truth. Contact never did any good to a culture that was not ready for star travel on its own. Not even once. Never mind that they welcomed it, that they craved it. Civilization was poison to a primitive culture. That's why she was out here, in the territory of the secondary species of this planet, the people called the Thacneri by the Ypsithra. The Thacneri occupied the southern continent in the eastern hemisphere, separated from the Ypsithra by a mountainous isthmus or by a lot of water, depending on the mode of transportation. The Ypsithra word *thacneri* most closely resembled *yeti* or *sasquatch* by history and derivation. This other species was mostly legend to the Ypsithra.

Surveys and aerial photographs had identified several densely populated areas. But the Thacneri were a primitive people who lived in the jungle and did not travel by roads. It was impossible to know precisely where they were and how many they were from above. Not with the dense jungle canopy in the way.

The only conclusive way to map out the borders of the Thacneri lands was on foot, quietly and stealthily. It was Michaela's mission, in cooperation with the Ypsithra government, to map out a ring around the Thacneri territories a hundred miles wide—a zone forbidden to anyone who had ever known gunpowder. Areas beyond the ring would then be available for cautious, low-impact development. The beacons she was placing every five hundred meters would signal if a Thacneri wandered across the line, and future adjustments could be made.

Michaela glanced at Robin as he walked away. The back of his shirt was damp and clung to his back, showing off the new muscle there. She made a mental note to make herself *forty* years younger the next time she fantasized about one of her students. Then she shook her head, reminding herself that he was just another graduate student. He was a transient. A warm body. In a couple of years, another fresh face would replace his. No sense getting attached. Or getting any inappropriate ideas. No, she would be careful with him.

One of the Ypsithra bearers approached her in an agitated state. He was talking so fast, Michaela could barely understand him, even though she knew their language well.

"Two of the brothers are missing, Great Aunt," it said. "Two are missing!"

Michaela stood up. "When?" she said.

"Two of the brothers have disappeared. Perhaps eaten by predators. Perhaps dead."

"When were they seen last?" Michaela asked, but the creature was hysterical.

There was another standing behind him. "The brothers were present when the spear landed, Great Aunt."

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Michaela nodded. She had a growing suspicion. She raised her voice, "I need a search party. Robin, Scott, Marcus, Sten, Xesthra, and Bati'stha, you're with me. I'll leave Angus in charge back here."

While Angus took over with the main part of the expedition, Michaela led the smaller group back toward the site of the spear attack. Not far along the trail, two sets of Ypsithra tracks led into the bush. Michaela nodded with grim satisfaction. The Ypsithra were an insanely curious species, with a perverse sense of adventure and glory. These two young laborers had ventured off to meet their unnamed cousins.

Michaela slipped a bolt into her plasrifle. "Let's go get them," she said.

Michaela had made first contact with the Ypsithra a decade before. By tradition and long experience, the Confederacy dispatched a single xenologist to a new planet to make contact with the dominant species. That xenologist went unarmed and with no high-tech gadgets other than a simple communicator. Even though she had contacted eleven species previously, she had felt the same thrill of excitement and fear as the shuttle lifted off without her, leaving her on a deserted sandy beach ten kilometers from the nearest settlement.

That contact had gone well. In fact, it was the best first contact she'd ever made. The Ypsithra were gentle and peaceful. Their leader was an old female. (All Ypsithra were born male, then metamorphosed to female later.) Once it was made clear that Michaela was female, the Ypsithra happily gave her their love and trust. She soon made friends with some of the younger ones, a breeding pair named Chesthul and Irisni.

Chesthul and Irisni took Michaela into their home and introduced her to Ypsithra family life. Their large brood swarmed all over the house, and Michaela was never found without one of the children in her lap. It was like being swarmed by giant, six-legged puppies.

It wasn't unusual for a child to die. It happened all too often in the primitive Ypsithra culture, so Michaela didn't realize anything was wrong until it was too late. Much too late. Her friend Chesthul was one of the last to perish, after his family had all gone before him. He clutched Michaela's hand and swore that he loved her, in English, and then sighed his last breath. Michaela's stomach turned to ice. Heartbroken, and with her mission in ruins, she returned to her ship.

When the epidemic ended, almost a million Ypsithra had died of *E. coli*, a harmless human symbiotic bacterium that had escaped Michaela's decontamination.

Interstellar space exploration had taught humanity some harsh lessons. The evolution of life on other planets varied enough from life on Earth that humans rarely encountered systems similar enough to present a danger of exchanging diseases. The vulnerability of Earth creatures to Earth viruses relied on millions of years of coevolution. However, the same thing could not be said of parasitic life forms, for which the body was nothing more than food. In this case, a lack of evolutionary contact simply meant that the victim had no immunity, and a lack of compatible DNA and protein codes was irrelevant to a ravenous organism that consumed and broke down molecules. One of the most insidious of these was *E. coli*, which lived peaceably in the human gut, but whose invasion into the Ypsithra digestive system became a pernicious and deadly infection. The *E. coli* living in Michaela's gut *should* have been killed and replaced with artificial nanotech symbionts. But somehow a few survived the process. Human beings seldom became ill from the common strains of *E. coli*. They were opportunistic pathogens only. The immune system kept them in check, restricting them to certain tissues, like the gut. When *E. coli*, or one of

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the other multitudes of bacteria in the human body, escaped the gut, and spread into the blood stream, an infection would result. But the Ypsithra, having never been exposed to anything remotely resembling *E. coli,* had no immunity at all. And since the bacteria in Michaela's body had already survived the strongest antibiotics known to science during her decontamination, there was no medicine left that could stop the spread of the new plague.

It was Michaela's opinion that most scientists were no more than highly educated shamans. They liked to believe that science was logical and rational. But quite often it was more like a rain dance. If rain followed the ritual, it was declared a success, and repeated as necessary. If rain did not follow, few considered that the ritual failed. Rather, they resolved to perform it more correctly next time. The cycle was repeated until rain came once more.

So it was with the theory of first contact. Many first contacts in the history of the Confederacy had been disasters, but the central dogma of contact remained untouched. It was considered in the best interests of all species to be contacted and brought into the community of planets, and to enjoy the benefits thereof. Each disaster only brought a spate of reanalysis and new theories about how to *better* initiate first contact.

Michaela became a maverick, advocating a policy of *no contact* until a civilization in question was ready to initiate. It took years, but her theory soon gathered support. The secondary species on Maht was the first test case for the doctrine of noncontact. She intended to show, through indirect observations at the edges of her buffer zone, how the culture of the uncontacted species would continue to thrive, grow, and advance, in comparison to the Ypsithra, who had faltered and begun to lose their cultural heritage immediately.

Once more, Michaela walked at the front, trailing the errant Ypsithra. They had veered into the forest, toward the nearest putative Thacneri settlement. Michaela hacked at the clinging vines, widening the trail for the search party.

Most jungles were alike, Michaela had learned. Bright green, because chlorophyll reflected light at the same wavelengths everywhere. Broad-leafed, fast-growing, hungry plants strained upward toward a crowded canopy, and every possible substrate was occupied by something growing. Brightly colored flying animals clamored in the treetops, and heavy, sharp-clawed predators hunted the understory. All of it was new, strange, and unnamed, but take one step back and squint so that the details blurred, and you could have been in a jungle on Earth.

The Ypsithra lived on a rocky coast in the temperate region, but they took to the jungle like a pack of monkeys, and Michaela had to hurry to keep up with the runaways. As she followed the trail, she thought about the lecture she would deliver to them, in their own language. First, she would shame them Ypsithra-style by promising to tell their mothers and grandmothers what they had done. Then there would be an old-fashioned human style dressing-down, after which they'd be sent back to base with an escort.

But Michaela's stomach knotted, because she could only do this if she found them alive, and she wasn't at all sure she would. She increased the pace, racing against time.

Within an hour, the sun began to sink behind the distant mountains, and the dim understory grew dark. Michaela regretfully called for a break. They were several kilometers beyond the forbidden zone, now—well inside the Thacneri lands. "I want silence," Michaela instructed the group. "And no lights."

They sat in the thickening darkness, eating dried meats and whispering among themselves. They couldn't continue searching for the missing Ypsithra

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without lights, but carrying a light through the jungle was too risky. Michaela judged they had no more than half an hour of useable light left.

"Let's get going," she said, standing up. The group began to stir again, packing up canteens and slinging packs onto their shoulders again. The soldiers Xesthra and Bati'stha shimmied under their packs, like a piece of the jungle broken off and come to life in the low light.

"Wait!" said Robin, too loudly. He was standing over Sten, who was lying on the ground.

Michaela came over and looked down at Sten. He was pale and feverish. His forehead shone with perspiration. His body trembled and he struggled to sit up.

Michaela's heart pounded, though she tried not to show any outward sign of it. First the young Ypsithra brothers had disappeared. Now she had a man down with some kind of fever. How many more deaths would Michaela be responsible for?

She put a hand on Sten's forehead and pulled it away quickly. *Hot as hell.* "We'll camp here for the night," she said.

Above the canopy, two moons rose along with Sten's fever. They couldn't avoid using a flashlight to open up the medkit and find medicines for him. They were packed lightly for a day trip, so there were no tents or even blankets to shelter them. Just the roof of green, green leaves—green even in the middle of the night, because in the jungle green is not just a color of light, but a quality of being. A jungle is always green, even in the dark. Always hungry, always waiting for daybreak, for an opportunity to get just a little closer to the sun.

Creatures stirred in the dark. Michaela stayed awake to guard along with Xesthra and Bati'stha. Their night vision was keener than hers, though Michaela's hearing was more acute. Between them, they waited for Sten's fever to break, or for the Thacneri to overtake them in the dark with their primitive spears. Michaela kept her plasrifle near to hand, but had little hope of using it in the night. Absently, her fingers ran over it, brushing grit away from the charging chamber. Michaela frowned, making a mental note to clean it as soon as they returned to camp. A dirty plasrifle could easily misfire.

The plasrifle was very deadly to the Ypsithra. A direct hit killed 95 percent of the time. In contrast, the plasrifle killed only 75 percent of its human targets. But that hardly mattered because they had not brought night-scopes and there was nothing to aim at in the darkness.

Robin sat next to her. Michaela knew he was there, but he was nothing but a deeper blob in the night and she could not see him. There was not much else to do but wait for morning, and so they waited.

"Do you think they're watching us right now?" said Robin softly.

Michaela whispered back. "Could be. We wouldn't know if they were out there, perched in the trees, with spears pointed at us."

"Did you ever have a first contact that went . . . badly?" he said.

"You mean did I ever get killed and eaten by the natives?"

Robin chuckled. "Did you?"

"Obviously not, but you know what happened to Angus's first mentor, Sidney Walsh?"

"Thrown off a cliff by Tremorthians?"

"That's the one," Michaela said. "It's never far from your mind, that this time could be the last."

"You know it's impossible, don't you?" said Robin.

"Impossible? What's impossible?"

"To avoid making contact," Robin said.

"Rubbish," Michaela answered. "We don't want to and we're not going to."

"Just like that," said Robin. "You'll leave the next great xenological discovery lying there, fallow, waiting for someone else to claim it?"

"I will," said Michaela, "and so will

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you."

"So we both wait, but what about the other guy?"

"We will all wait," said Michaela. "What's so hard to understand about that?"

"Someone will go in. It's inevitable. It's only a question of when."

"It's not inevitable. We are human beings. We're capable of restraint."

"What if I'm not?"

"Then I'll restrain you," Michaela said, and the darkness vibrated with new tension.

There was silence for several long minutes, then Robin said. "Do you ever wonder why we went looking for intelligent life to begin with?"

"I know why I did it," said Michaela.

"Why?"

Michaela took a breath and thought. "The excitement of finding something new and strange, something all my own, that no one else had ever touched."

"Interesting," said Robin appraisingly. "You know what I think?" he said, and he didn't wait for an answer. "I think it's a great exogamy hunt."

"You think we traveled to outer space looking for young girls to marry our sons?" Michaela said.

"Basically, yes. Consider the question, 'are we alone in the universe?' Of course we weren't alone. We lived on a planet filled with all imaginable biodiversity. The species of animals and plants were yet unnumbered, but we still wanted to know if there was something else out there, in space."

"But there was no other intelligent life on Earth," said Michaela.

"That's what we told ourselves, but the word intelligent defied definition, didn't it? First, we defined ourselves as tool users, declared our aloneness, and wished that there were creatures like ourselves on other planets. Then, when it was finally determined that other animals used tools, or could learn language, or had every other characteristic that we thought made us unique, we found other reasons to discount the existence of other intelligent life on Earth. The truth is, we wanted to find life out there that was *like us*."

Michaela pondered that thought in silence. "But we did. We found dozens of intelligent species."

"Found them, and kept looking. Admit it. The Tremorthians and Ypsithrans and Gouans are not enough for us. We've found them, but we've never stopped the search. Instead, we study them, find them deficient in some way, and keep looking. What we're really looking for is some colony of green-skinned amazons, or maybe a whole galaxy full of aliens, all of whom look exactly like humans except for their coloring or some exotic brow ridges or something like in the old television shows."

"So you're saying," said Michaela, "that we're compelled to discover and describe new species because of our ancient drive to marry outside our own tribe?"

"Exactly," said Robin. "And the larger our tribe gets, the harder we have to look. Right now the tribe is the size of the whole galaxy. That's why I don't think this small population on this small continent can go undiscovered for more than an eye blink. That's why I think what we're doing is pointless. Maybe even wrong. Why deny ourselves an important scientific discovery just so you don't have to relive what you went through with the Ypsithra?"

Michaela struck out in the darkness and backhanded Robin's face. "Watch your tongue, Robin. I'm still in charge here, and as long as that's the case, the Thacneri will remain ignorant, uncontacted, and pure."

Robin didn't answer for a while. Then he said, "I'm going to sleep now. Good night," and he faded away into the darkness. Michaela fancied she could hear his heavy breathing added to the soft sighs and snores around the campsite. What he had said had irritated her, and worried her. And a very small voice inside

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her wondered if he was right. She wanted him to be right. She was keenly aware of the living, intelligent creatures in this forest. She wanted to talk to them, to meet them herself. The fact that she could not grieved her. How could she explain that to him? The desire inflamed her senses in a way that bordered on sexual arousal. Then she thought of Robin's exogamy theory, and her own physical reaction appalled her. She became angry instead.

If she couldn't explain the doctrine of noncontact to her own students, who could she expect to understand it? And what if Robin decided to do something foolish? These young men hardly seemed to realize how dangerous their situation was. Contact could be deadly. They walked a razor edge, skirting the Thacneri territory, and two of her expedition had already run off into the forest, chasing glory.

Instead of going to sleep herself, she sat up, trying to comfort Sten, trying not to worry about the missing Ypsithra and what was going to happen the next day.

Sten moaned with his illness, and could not be quieted. He thrashed about, unable to get comfortable. The medicine they gave him put him to sleep for short periods, but always he would wake, clutching his stomach or wracked with body pains from the fever.

Michaela finally took his hand, and he went to sleep and would not let go.

"You sleep, too," said Xesthra. "We watch."

Michaela shook her head.

"Sleep," he repeated. "We Ypsithra often stay awake through the night. It's nothing to us."

Michaela nodded, knowing it was true. The Ypsithra could stay awake for days at a time, and then sleep for days. She should let them guard through the night. It was a good use of the group's talents. She lay down next to Sten, still holding his hand, and closed her eyes, knowing she would not sleep.

Michaela stayed that way all night, listening to the darkness. Twice she was certain she heard a six-legged creature walking through the forest nearby, sniffing at them, and whispering in some strange language. But Xesthra gave no alarm. Couldn't he hear it? Or was she dreaming? She gave up trying to sleep, and waited for dawn. She knew if the Thacneri wanted them dead, they would be dead. She knew that she must give up on the young brothers and do her best to get the team back alive. They were too far in. They would end up making contact, and in the worst way possible. A large group, carrying weapons, yet vulnerable, with a sick man in their midst. She wondered if her motive for chasing the lost youngsters this far was entirely honest.

Morning came at last, and Michaela rose with a sigh of relief. She had slept, finally, knowing that she did so only by the fact that she was aware of waking up. Sten slept beside her still, and she slid her hand gently out of his grasp and felt his forehead. He was still feverish, and she could tell from his pallor that he could not walk that day. She cursed under her breath. For all she knew, they were a hundred meters from a village and the Thacneri might come upon them any time on their way to the river to fetch water for the day. But there was nothing for it. They couldn't leave Sten, and they couldn't carry him back. Not in this condition.

She gave her instructions over a very subdued breakfast. "We may end up making contact today, after all," she said. "Marcus, I'm sending you back to the expedition. Tell them Sten is sick and they should send a stretcher." She glanced around the circle. "The rest of us need to give Marcus all of our high-tech gear except communicators. Guns, anything that explodes, anything with a battery, anything plastic, anything steel. Go through your packs, and I'll check when you're done."

"But that leaves us with nothing," said

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Scott.

"Right," said Michaela. "I didn't want to make contact with this species, but if we do it, it'll be done right—according to the strictest protocols."

Scott frowned and unzipped his pack. "What about the packs themselves . . ." he began.

"Good idea," said Michaela. "The packs have plastics, metals, and zippers. Put the stuff in your packs and give it to Marcus."

"I can't carry it all," said Marcus.

"Then let's bury them," said Michaela. "Until the expedition comes back." Michaela stopped, thinking. "No, we'll hang them in a tree. With any luck, the Thacneri won't realize there's anything special up there."

The group nodded, and Michaela saw a gleam in Robin's eyes.

"Robin, you're coming with me to look for the brothers. Everyone else, stay put until Marcus comes back for you. Then take him back to the expedition. If we're not back by tomorrow, then abort and return to base. If the Thacneri show up here, be quiet, be submissive, don't make any sudden moves. Try not to go anywhere with them." Michaela slung her plasrifle over her shoulder and strode out of their makeshift campsite, following the still-visible trail of the two wayward Ypsithra brothers.

When Robin was out of earshot of the group, he said, "What are you doing with that rifle? You can't make contact with a rifle."

"I'm not making contact," said Michaela.

"Well, it sure would have been nice to have my pocket knife, then," said Robin. "Why don't you make up your mind?"

"If we're captured, there will be a minimum of technology on us to contaminate their culture," said Michaela. "But if we see them, I intend to do everything I can to avoid meeting them."

"Including killing them?" said Robin. "You're not a killer. You can't. Why don't you just accept the inevitable? You've got one foot in each camp, now. Determined not to make contact, but prepared just in case. You should go back and put that gun up the tree with the rest. Then we go in the way it's always been done before. Unarmed and with open hands."

"We're not going in. Not this time," said Michaela, and her tone made it clear there wouldn't be any further discussion.

When humans die, they look almost asleep sometimes, and it can take some time to realize that death has occurred. With the Ypsithra, there is no mistaking it.

The brothers looked *deflated* lying on the forest floor in their own blood. Their gear and possessions were gone. Their limbs sprawled in all directions, and their leathery, segmented backs were crusted with blood.

"That's it, then," said Michaela. "We'll send a team back to retrieve the bodies." Her guts were cold and there was a pinching behind her temples. She had known these brothers from early childhood. She knew their lineage, and had dined with their grandmother many times. She began to rehearse what she would say to their relatives. They need not be told what a foolish thing the brothers had done.

Robin looked around nervously. "Do you think they've gone?" he said.

"They've been dead all night," Michaela said. "Damn! If we'd only gotten here sooner." Her hand wandered to the butt of her rifle where it hung against her hip. She sighed. "Let's go, then," she said, turning back the way they had come.

Michaela took several steps and realized Robin wasn't following her. He stood looking into the forest. "I think the village is over there," he said. "I see a trail. And up there, through the canopy, that wisp. Isn't that smoke?"

"It's not for you, Robin," said Michaela. "Let's go."

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He didn't move.

The ball of ice in her stomach turned molten. "I said, 'Let's go.'"

Robin shook his head. "I'm going to the village," he said.

"You're not," said Michaela, and somehow the rifle was at her shoulder, the pinpoint sights lined up on Robin's chest.

Robin held his hands out to her, palms up. "This is what I've waited for all my life," he said.

"Get in front of me," Michaela ordered. "Start walking."

"I'm going," said Robin.

"You're throwing your career away," she told him.

"This *is* my career," he said.

"Don't make me kill you," Michaela whispered.

"Don't make me call your bluff," Robin said.

Michaela clutched the rifle, and willed herself to pull the trigger, but nothing happened. After a very long time, she lowered it, and stared at Robin. "You'll kill them all," she said.

"We can't kill them all every time," Robin answered. "This isn't a wildlife refuge. Those are thinking beings out there."

"They'll kill you," said Michaela.

"I'm a trained professional," Robin answered, with a grin.

Michaela's heart tightened. In spite of their aggression, she knew it was possible for Robin to make a successful contact. But even if they were to discard the doctrine, she didn't want it to be ***him***. She recognized one of the emotions roiling in her belly as jealousy. But soon, it was swallowed by grief at what Robin was forcing her to do.

"Good-bye, Michaela," Robin said, and walked up the trail toward the Thacneri village.

Michaela raised her plasrifle to her shoulder and pulled the trigger.

The first thing to return was thirst. Michaela's tongue felt like sandpaper. Her lips were cracked and swollen. She couldn't speak, and she couldn't see. *Water*, she tried to say, but it wouldn't come out. Then the thirst faded as a wave of pain washed over her body. It started in her head, blossoming inside her skull until she thought her head would explode. Then it radiated down her body, making her limbs feel electrified.

A scream rose beneath her diaphragm and tore out of her throat, emerging as a ragged croak. The lips that couldn't quite whisper suddenly uttered a curse. "Goddammit!" She opened her eyes.

She found herself inside a dark, smoky hut, and memories of Chesthul and Irisni overwhelmed her. Tears welled up and ran from her eyes. The pain still pulsed up and down her body, nearly blinding her with every crest.

"She's awake," said a voice. Was it Robin? No, Sten.

Something cool touched her forehead. Someone tipped a warm drink between her cracked lips. "Drink," said the voice, and she knew it was Sten. Robin was dead. She could not remember how she had come to be in the hut.

Michaela's second awakening was just as painful as the first, but her head was clearer. She looked around, and saw Sten sitting beside her. An Ypsithra crouched in the center of the room, its back to her, tending a smudgy fire.

"Don't try to sit up," said Sten. He was sitting on a grass mat next to her, cradling a large clay cup in two hands. "Nurse Ratchett will give you some more sleepy juice if you're not resting properly."

Michaela followed Sten's glance to the Ypsithra tending the fire. It turned. She recognized it as being in the middle of its mid-life metamorphosis. The proportions of its body were off, though. A cranium too deep, external carapace too broad, front legs completely hairless.

A gasp ripped out of her. This was a Thacneri. Then she remembered. She had shot Robin. She had forbidden him

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to make contact. And then what? Nothing?

"Your weapon misfired," said Sten. "You're lucky to have survived."

"Seventy-five . . ." said Michaela, trying out her voice. It hurt.

"Yes," said Sten. "The energy beam kills 75 percent of human targets. It blasted backward onto you. You're a lucky one in four. You should have kept your weapon clean out there."

"And Robin, he—" stammered Michaela, her mouth unaccustomed to speech. "He's not dead. He went and made contact anyway. He didn't listen to me."

Sten chuckled. "No, he performed CPR for twenty minutes to save your life, then carried you back to our temporary camp on his shoulders. The Thacneri found *us*. There was no avoiding it. We'd wandered too far into their territory, and they had been watching us for a long time."

"Stupid. I should have crossed the river. We were too close," Michaela rasped.

"She's awake!" said Robin from the entrance to the hut.

The Thacneri nurse stood up on its hind legs and spoke to Robin. The language was nothing like Ypsithra. Robin put a finger to his ear. Michaela noted with pride that he'd already programmed and begun training his translator. He answered the nurse with a few words, then ducked inside and sat next to Michaela.

"It's done," he said.

"I know," she answered. "You need to call the station. Get some antibiotics—"

"I already have," said Robin.

"Make sure you offer appropriate gifts to the head woman," said Michaela. "And do not ask too many questions."

"Michaela, it's okay. I'm *your* student, remember?" He took her hand and squeezed.

Tears leaked out of Michaela's eyes. Her throat swelled. "Robin, I'm sorry," she said. "I'm so sorry. I nearly killed you for my doctrine."

"But you didn't," said Robin. "You did everything you could to protect the Thacneri."

"It wasn't enough," said Michaela.

"It could never be enough," said Robin.

"I know," said Michaela. "I know that, now." She closed her eyes, shutting out Sten and Robin and the Thacneri nurse and ending the conversation in a way that only the very sick and wounded can, willing sleep to take her away again, just for a while. She should have been angry, at this enormous failure of the doctrine. She should have been jealous that it was Robin stealing her glory. Instead, in a warm place somewhere beneath the electric burning of her nerves, she felt deeply relieved. This was no longer her battle. With that comforting thought, once more, she slept. ■

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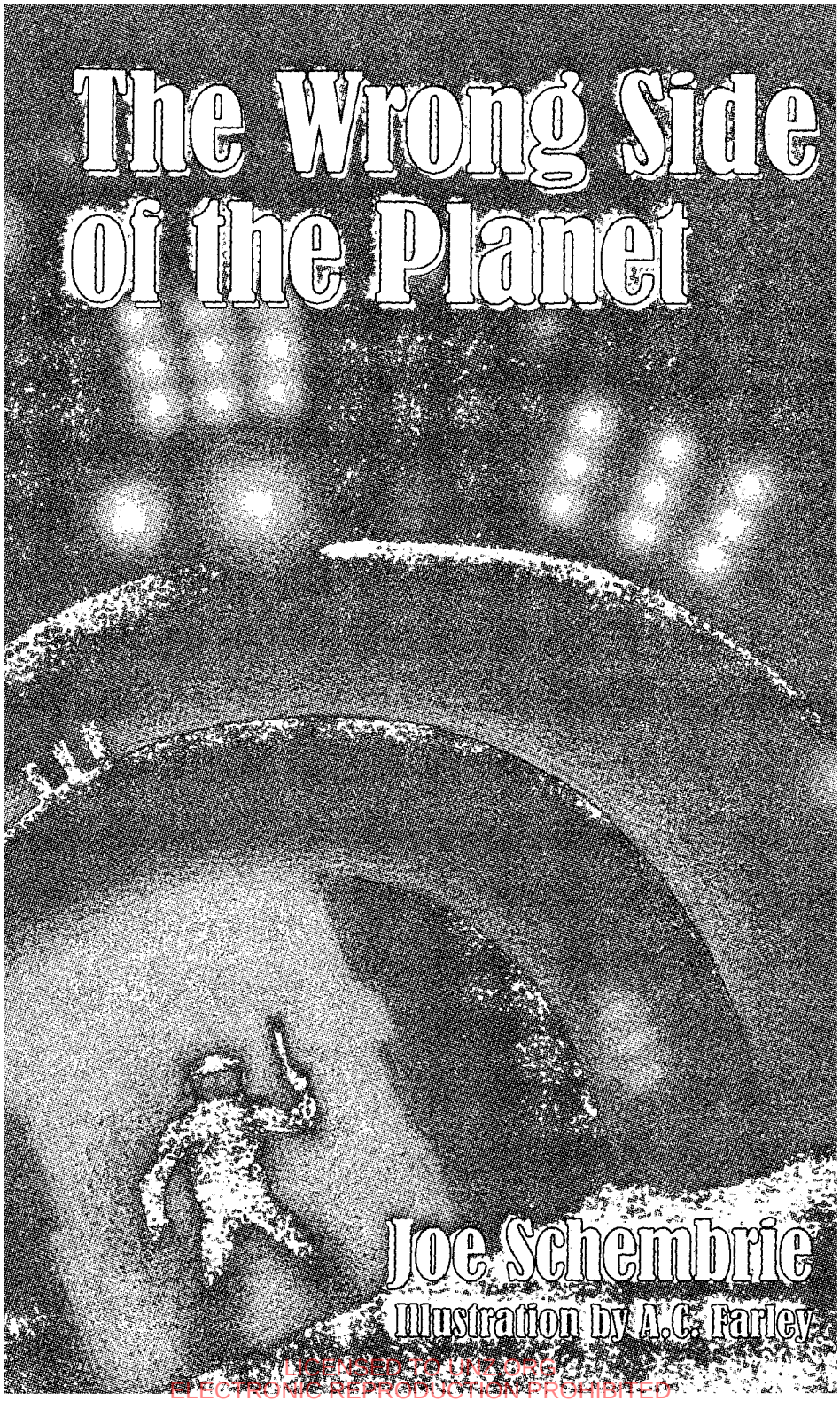
The Wrong Side of the Planet



Joe Schembrie

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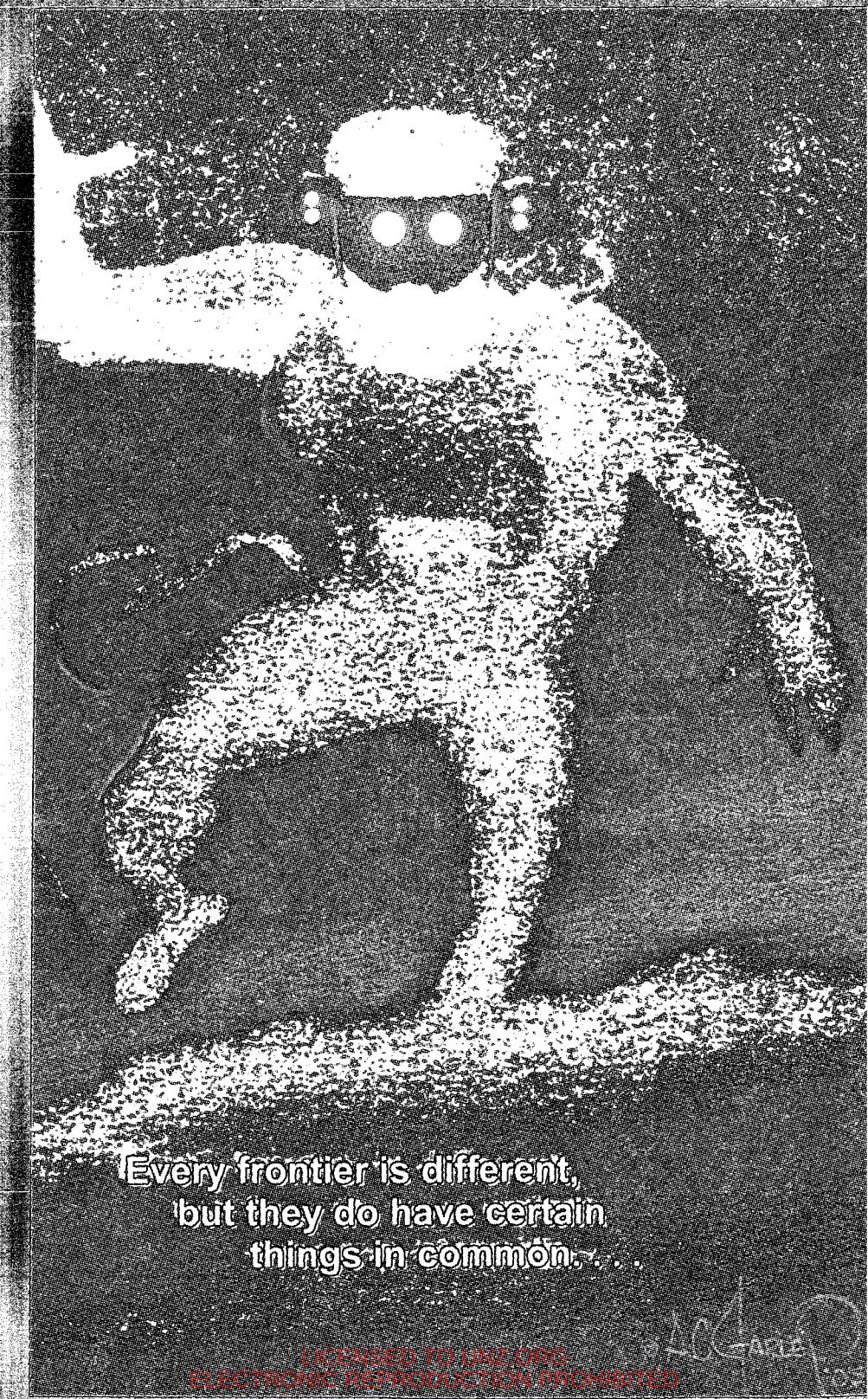

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"Yes, I do know I'm on Mars," Eric Toshimi said as he loaded the pressurized tent into the trunk of his newly purchased, two-decades-old scooter. "That's *why* I want to go on a road trip!"

The only other people in the mining base's suit-up room that morning were Craig Wright and Tully Hemple. Eric's friends had partied last night and were at that moment swinging pick-axes on shift, but Craig was boss and Tully was airlock custodian.

"If ya wanta see the planet," Tully said, "ya shoulda joined the Mars Planetology Service, 'stead of a mining outfit."

Eric shot him a glance. Tully wore a baby face and an untucked tee-shirt, perhaps the same one, with few washings, that he had worn every day of the full Martian year that Eric had known him. Eric didn't mind the sloppiness. It was just that when he had signed up to mine platinum on Mars, no one had told him about the smells.

"To join the Service, I'd need a science degree," Eric replied. "And I don't have enough money yet for that."

"Ya don't?" Tully asked, laughing. "What have ya been doin' with your bonuses? Drinkin' them away? Spendin' too much time in the VR tanks?"

Furrowing his eyebrows, Eric went back to packing.

Craig shook his head with deliberate strokes, like a grandfather clock's pendulum. "Eric, you won't make money puttering out there. The money is a hundred meters below our feet, in the rock. There's nothing out *there*. Just ways to get yourself killed. Dust storms, freezing to death, asphyxiation—"

"The suit'll protect me." Eric stepped into the boots, and zipped the mars-suit.

Tully held out the helmet. "The suit won't protect ya against Swinton."

"Tully!" Craig snapped, as he did a dozen times a day. "There's a hundred million square miles out there! The chance of Eric running into Def Swinton is zero!"

Tully blinked and did what he always did when scolded. He changed the subject. "So, ya gonna drop by the Vulcan guy?"

Eric smiled. "Actually, I was thinking I would."

"Swell. Tell him I use his stuff. So where you goin' after that?"

"Thought I'd see Hellas."

Tully chuckled. "Hell of a place, Hellas!"

Eric's mind was already roaming the Martian plains.

"You should really hop a transport over to Base One," Craig said. "It's between Mariner Valley, Tharsis, Olympus Mons—all the tourist sites. You're on the wrong side of the planet for sight-seeing."

"I've heard that a few times already," Eric understated. "But I won't sight-see for long. Now that my indenturement's over, I can freelance and make real money."

Craig shrugged. "Well, Earth has its unemployment lines, but Mars is a fixer-upper and there's always work to do. So call us, Eric. We'll take you back, any time."

Two earth-years of chipping shafts and galleries into solid rock came rushing at Eric's mind's eye, and he almost shuddered.

They walked him to the main airlock. Peering through the window at a surprisingly blue sky above the rock-strewn terrain of Syrtis Major, Eric broke into a wide smile.

"It looks like the right side of the planet to me," he said. "The *top* side."

Eric rode the scooter to the nearest hill crest and surveyed the dust-smudged domes below. He took the computer tablet from the suit pouch, plugged in the communications cable, and aimed the tablet's camera.

"Hey David," he recorded. "My last look at Areopagus Mining Base Three. At least for a while."

He lowered the camera eye, but kept

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the voice recorder active.

"I know you're going through final exams now," he said. "I'm sorry if my last couple of messages put you under stress. I'm just taking a little vacation. Don't worry, the money will keep coming, your tuition is covered. You're my brother."

He closed his eyes and released a sigh that was two years in the making.

"But—David!" he said. "I had to get out of there! They were talking this morning about all the dangers on Mars, the dust storms and even this fugitive murderer, but you know what the biggest danger on Mars really is? Terminal *boredom*! Staring at walls of rock, ten hours a day! I swear, sometimes I'm ready to slam a pick-ax into my skull—just to see if I have any feeling left!"

Eric paused, and reflected. He erased everything after, 'You're my brother.'

Injecting cheerfulness into his tone, he recorded: "Well, onward to Hellas. Study hard, little bro. Get that doctorate and come up here, like we planned. Then I'll make a real Martian out of you!"

He extended the suit antenna and uploaded to the company comsat. The message coursed Earthward, and he resumed riding.

The access road came to a fork. Consulting his computer map, he traced his itinerary through the arrowhead-shaped region of Syrtis Major to Tyrrhena, and then toward Hellas. First, though, he would head toward a stylus-drawn "X," with "VULCAN" scrawled alongside. The planetary grapevine said Vulcan was well worth a visit.

For the rest of the morning, he zipped beneath clear skies, across the Arizona-like landscape, at a breakneck fifty kilometers per hour, over the ochre plains of Syrtis Major on the one-lane dirt road the atlas loftily captioned the Isidis-Huygens Route.

He waved at a lone teleoperated truck, the only traffic. He saw genetically engineered lichen clinging to the rocks, and even some genetically engineered cacti half-heartedly poking between dunes. Phobos ascended as dust devils roamed in the distance like branchless ents.

The road was bumpy and he soon got sore, but as he listened to his music archives through his suit earphones, he found himself grinning at the hills.

"FREEEEEE-DOM!" he whooped.

His reverie broke a few minutes later, when he topped a hill—and nearly tumbled in shock. He jammed on the brakes and stared.

Mere steps away, an eyeless elephant towered over him. Only it wasn't an elephant, it was an elephant skeleton. And the skeleton was made of iron. And it was five meters tall.

A man in an optic-green mars-suit dangled from a rope suspended alongside the elephant's head, shooting blue fire into an ear.

"Hello," Eric said, over his suit radio.

The man started, fumbled at his side—and hastily aimed a gun at Eric's chest.

That afternoon, Eric sat at a slate-topped table in a cavernous dining room, gazing through thick leaded glass at the "yard" beyond, and at the oversized ironwrought skeletons of a lion, a dragon, and—an elephant.

Nathaniel Aiya, proprietor of Vulcan Metalworks Limited, refilled the cup in front of Eric with herbal tea. Eric, his mouth filled with sushi, motioned for him to stop.

"Thanks," Eric said. "But I really must get going."

"You have hardly eaten anything," Nathaniel said, in deep voice that somehow made his English accent all the more lilting. "Surely, you must let me make amends for my overreaction!"

"No need, Nathaniel," Eric said. "I realize that living here alone, you've got reason to be careful. And though this is great, I really can't eat more."

Nathaniel's huge hulk seemed to shrivel, but then suddenly his eyebrows

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raised, his teeth flashed and a finger pointed ceilingward. "I know! I shall wrap the food!"

"Uh, well, it won't keep. I'm traveling light. I don't have a refrigeration unit."

"Ah, but you do. It is called Mars."

Eric nodded, wishing that Nathaniel hadn't assumed that since his guest was three-quarters ethnic Japanese, he would naturally want sushi. Like half the immigrants on Mars, Eric was an American expatriate and would have preferred pizza.

While Nathaniel scooped the serving tray and shuffled to the kitchen, Eric returned his attention to the sculptures in the yard.

"You sell your artwork?" he asked.

"Perhaps someday," Nathaniel replied. "Then again, I am corresponding with a lady in my homeland of Nigeria, who expresses a desire to visit. So I may not have time for hobbies."

Eric checked his tablet for the weather report: a wavefront of yet another interminable Martian dust storm was encroaching from the west. He had to move.

"So, Mister Toshimi, do you have ambitions for your wanderings?" Nathaniel asked from the kitchen.

"Yeah. Heading for Hellas."

"You are going to *Hell*?"

"Not Hell. *Hellas!*"

Nathaniel boomed laughter. Despite his annoyance, Eric found himself smiling.

"This impulse of yours," Nathaniel said. "To explore Mars. It recalls my youth."

"That why you came here?"

"Oh no. Health reasons. Advancing age, a disease of the muscles, and the heavy gravity of Earth were not a good combination. I often find this truth, of myself and others, that we come to Mars because Earth has become painful to us in some way. Family is the only thing I regret leaving behind. I have a son and daughter on Earth, and grandchildren I have never seen in the flesh. Eric, do you have family on Earth?"

"A younger brother."

"And what of your parents?"

"There was an accident . . . a car crash. A long time ago."

"I see."

Eric sipped his tea, and thought of all the reasons why Earth had become painful to him. Nathaniel returned from the kitchen with a foil bag, which he presented to Eric.

"Let me give you something more," Nathaniel said.

Eric followed him from the living room into a barn-sized shed, which was stacked high with the picks and shovels and other metalwares that Nathaniel bartered to the Martian mining outfits. Nathaniel opened a cabinet, and held out the handle of what appeared to Eric to be a dueling pistol.

"I copied liberally from Pauly's 1812 patent," Nathaniel said. "Adapting the design to the Martian environment proved difficult, but it now works quite well over short ranges. Bear in mind that it is breech-loading and fires but one shot per loading."

Eric concealed his disdain, but shook his head firmly. "No. Mars is a peaceful world. Besides, on Mars, guns are illegal."

"Which is why I make and sell them. Now, Eric, you are aware that there is presently a killer at large on this planet?"

"Yeah. Alexander Defner Swinton. Stabbed a guy down in Cimmeria. It's been all over MarsWeb for the past month. But there must be a million killers loose on Earth, and I never met one in all the years I lived down there. So what are the chances of me running into one guy here? Mars is a big world."

"No, Mars is a very small world. There are only so many places that people go."

"Well, I don't need a gun to handle an unarmed man."

"He is not unarmed." Nathaniel paused, and added softly: "Before I had heard the news, Mister Swinton came here. He—he seemed a good man."

Nathaniel pressed the Martian-forged

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alloy into Eric's hands.

As a person who has been confined in cramped spaces for months on end will do, Eric compulsively rode the rest of the day and then all night.

When dawn came, he parked near shade and pocketed the ignition key—a habit retained from Earth—and unrolled the paper-thin solar cells to recharge the scooter battery. He inflated the tent beneath a north-facing cliff, shielded from ionizing solar radiation. While the sun rose, he entered the tent, removed his suit, sponged his body, and unwrapped the sushi.

That was when he realized Nathaniel was wrong. Mars is not a refrigeration unit, it's a deep freeze. After a few futile knife scrapes, Eric rated the frozen fish at midway between feldspar and quartz on the Mohs mineralogical hardness scale. Forty minutes in the microwave, however, and the would-be sushi was not only defrosted, it was cooked. Eric ate heartily, then luxuriated as best he could in the cramped and spartan tent bubble before drifting off.

When he awoke that evening, he checked his position on the tablet's GPS map. His progress was slower than projected. All the favorite tourist destinations—Mariner Valley, Olympus Mons, Tharsis, and, yes, infamous Cydonia—were certainly out of reach, given his self-imposed schedule.

"Like everybody back at the base always says," he beamed David. "It's the wrong side of the planet."

He'd have to settle for Hellas. But better than staring at a rock wall, by far.

He crossed the equator and drove through Terra Tyrrhena, passing craters trailing leeward streaks of dark dust. The terrain was lighter than Syrtis Major, but the shape of the landscape—waves of rocky, frozen hills—remained the same.

In Tyrrhena, his suit sprang a leak. Around midnight, the mars-suit's life systems computer flashed a LOW PRESSURE message in the heads-up display. The suit, second-hand and badly worn in the joints, had developed a hairline crack, invisibly small but ultimately deadly.

Though he had seldom ventured onto the surface back at the base, Eric had always kept his suit qualification ratings current, and went about repair with serenity. He located the leak by rubbing a chemically treated cloth over his suit. He wrapped repair tape around the oxygen-triggered stain on his knee, and restored pressure with a squirt of his air bottle. The suit's sensors indicated no further drop-off.

He flipped the roll of tape like it was a giant coin, and smiled to himself.

"Not such a tough planet," he murmured.

His smile faded, though, at the starless sky hugging the western horizon.

When he slipped the tape into his pocket, he heard a clinking sound. He pushed open the pocket flap and saw Nathaniel's gun. He almost tossed it away. But no, it was a gift. Sighing, he plopped the gun and the box of bullets into the trunk, and drove on toward Dao Vallis.

Two days later, at sunrise, he stood at the lip of the canyon, overlooking its fog-shrouded floor.

"Maybe it's not Mariner Valley, but it's at least as large as the Grand Canyon," he said, panning the tablet camera. "Pretty impressive, huh, David?"

But David hadn't answered in a week. Eric shrugged and uploaded the images, wishing that he had someone to share the grandeur of the planet with.

The computer map indicated a skyhook bridge spanning the chasm nearby. As he drove, he strained to see the cables stretching from one side to the other, but couldn't make out anything. At last he came to the marked position. He saw no bridge, but instead only a pair of broken metal posts, which jutted waist-high, about three meters apart, at the lip of the canyon. Directly across, half a kilo-

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meter distant, a pair of long cables dangled against the canyon cliffs, their ends lost in the bottom mist.

He blinked and stared at the posts. There was no way to tell for certain how long ago the bridge had been broken, or whether the damage was natural or artificial, accidental or intentional. But if he had to guess from the repeated dents, he would say that someone had deliberately rammed the posts with a large vehicle.

According to the MarsWeb reports, Eric recollected, Def Swinton had escaped from the mining base in Cimmeria by heading due west. Which would have brought him to Dao Vallis.

Eric turned on the recorder, but couldn't think of anything to say. Besides, David was going through exams, and didn't need new worries. And if Swinton had been here, he was long gone.

Eric moved within a footstep of the canyon edge, contemplating the thousand-meter drop. Suddenly, the wind fluxed and he heard a noise behind his back. He felt a wave of vertigo, like he was falling—being pushed—

He snapped around. A dust devil, barely larger than himself, twirled a few meters away. Its undulations seemed like belly-laughter. He swung at it—and sighed.

"Now *I'm* getting paranoid," he whispered.

On the tablet, the recorder icon still glowed green. He erased the last remark.

From Dao Vallis, Eric headed west. He saw no vehicles, structures, or people. He could have been the only person on Mars.

At the corners of his field of vision, he sensed faint lights at night, and in daytime, silhouettes moving among distant rocks. When he turned, nothing was ever there. He'd heard that, on the unprotected surface of Mars, cosmic rays sometimes triggered flashes in the optic nerve, stimulating flickers of illusion. Maybe that was it.

One day, he jolted awake. It was only the wind, rustling the tent. But he couldn't get back to sleep. He thought of the gun in the trunk. It was an act of will to leave it. He knew that if he carried it on his person, he would be crossing a psychological line, the same one that had Nathaniel ready to shoot every visitor on sight.

But, he reminded himself, one of those visitors *had* been Def Swinton.

Eric eventually did get back to sleep. When he awoke again, he found his knife unsheathed alongside his sleeping bag. He couldn't remember putting it there.

Finally, he reached Hellas Planitia—the great two thousand kilometer impact basin between Syrtis Major and the South Pole. He saw no bordering cliffs, for he was entering from the northeast, and ancient floods had converted the crater's rim to a gentle slope.

Soon after he had descended to the crater floor, the cloud of dust in his wake abruptly faded, and he heard a new sound . . . a squishing sound. He stopped and looked down. The scooter's tires rested in a millimeter's worth of liquid water. Droplets of water trickled and dripped from the scooter's tires and sides, and from the mars-suit's legs. Flecks of faded-orange sludge oozed over his boots.

Aiming the tablet cam, he said: "Hey, David, look—Mars, the Mud Planet!"

The most recent weather map showed a chunk of storm detaching from Noachis and heading on a collision course. He wanted to get to his destination before then. He spared only a nap at dawn, then rode on in broad daylight, through slicks of mud and then long dry stretches, steering toward the designated map point.

Finally, beneath the vastness of a sky tinged scarlet from dust, he spotted a dimple on the western horizon. It resolved into a house-sized pressure dome. About thirty meters short of the

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dome, he came to a hand-scrawled sign of sheet metal, leaning against a rock.

LOW POINT STATION—OFFICIAL LOWEST ELEVATION ON MARS, the sign read. He took a picture.

"Lowest point and highest atmospheric pressure," he said into the recorder. "You probably already figured it's above freezing, but this suit is almost muggy."

Clumps of grass speckled the ground and bobbed in the breeze. Eric videoed a few seconds, and commented: "Looks like they simply imported some kind of terrestrial grass, instead of genetically-engineering a new species. I suppose it's possible for some Earth plants to survive on Mars, especially in Hellas, now that terraforming's under way."

He listened to the wind through his helmet, and his mind roamed. When he snapped out of his reverie, he realized he had been there for several minutes, and yet no one from the station had greeted him. He didn't see anyone, either.

He dismounted the scooter and walked toward the dome.

"Hello? Anyone home?" he called out on his suit radio.

The outer door, caught half open, bore marks that Eric recognized as the work of a mining pick. He peered within and saw the inner door open as well. Beyond was darkness.

He hesitated at the entry. He stared inside the dome, then at the scooter, locked in indecision. Finally, he scowled and strode toward the scooter.

"*Paranoia!*" he muttered, lifting the trunk lid.

The gun rested at the bottom of the compartment, wedged between the bags holding his supplies and the tent. Water from wheelwell leakage clung to the gun's barrel and handle. Shaking off the moisture, Eric opened the soggy-cardboard ammunition box, clumsily loaded in a round, and fitted a gloved forefinger inside the oversized trigger ring.

The sun cast his shadow, arm extended with the gun barrel at the end like an accusing finger. He thought about the personal legal consequences of exhibiting an unregistered and unlicensed firearm around a government facility. He almost returned the gun to the trunk. Looking at the ax marks again, however, he compromised over his mixed feelings and pocketed the weapon.

He returned to the airlock and slipped inside the dome. The heads-up display reported a sharp fall in external temperature, for Martian air is a poor heat conductor.

Feeble light from a shrunken solar disk streamed through a porthole. His eyes adjusted. He found the wall switch and flicked it. Power dead.

He turned on his headlamp and swept the beam. Every cabinet door was wide open. Equipment, plants, soil, and cracked pottery littered the floor.

And in the center, in a glassy pool of frozen blood, a motionless body lay sprawled.

Low gravity or not, Eric felt faint. Falling into a chair, he rolled from the inert form, and stared. His thinking flowed like the north polar glaciers.

The man was dead, obviously. He was in a depressurized room, and wore only coveralls. And a bullet hole in the heart.

Eric collected his thoughts and herded them forward. If he had been on Earth and had stumbled upon a corpse, he would have called the cops. Eric tried to think of who were the cops on Mars. His fingers extended the suit antenna.

NO SIGNAL, the tablet declared. He snapped a picture of the corpse and walked to the airlock threshold. Phobos hung low in the east.

CONNECTING PHOBOSCOMM, the tablet read.

"Mars Civil Authority."

A rare female voice. The first time he'd spoken to a woman in ages, and it had to be about *this*.

"Uh, hello," he said. "I'm reporting a ... well, I think it's a murder."

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"*What?*"

Murders were not unknown on Mars. There was an administrative process. After Eric uploaded his photo of the crime scene, a new voice came on within minutes.

"We wondered why he didn't report," it said. "We're already preparing to send a team."

"When will they get here?"

"Don't know. Couple weeks."

"*Weeks?*"

"They're waiting out the storm."

"Why? What's the big deal about a dust storm?"

"Have *you* ever been in one?"

"I'm coming into one right now," Eric said, noting the growing haze obscuring the scenery beyond the immediate vicinity of the dome. "Ground visibility here is already below a kilometer."

"We're not talking about the typical Martian storm."

"Well, I've seen plenty of dust storms from the mining base where I worked. The dust might be moving at three hundred kilometers an hour, but it's finer than talcum, right?"

"Hellas is different. It's where all the dust on Mars collects, and the higher air pressure picks up bigger particles. Visibility goes way down."

"Down to what?'

No response.

Phobos had set and taken his communications link with it. At his current high latitude, Eric had to wait a few minutes for the co-orbiting comsat to rise and signal-coverage to resume. He turned toward the west, hoping to spot the glint of the ascending satellite above the ground clutter.

His jaw slowly dropped.

The horizon had been swallowed without a trace. A tidal wave of dust rolled across the plain, transforming the air from clear to dirty orange—and then dark, angry red. Eric hastily flipped his visor down, with barely a second to spare before the faceplate-scratching dust impacted.

Then he noticed the scooter. Shy from his experience surprising Nathaniel, he had deliberately parked at a distance. The thirty meters hadn't seemed so crucial, then.

A curtain of swirling, rusted powder enveloped the scooter. The vehicle faded to a ghost, then vanished. The wall of dust relentlessly advanced toward him, consuming the ground, ever closer, until the tips of his boots disappeared. Eric reflexively stepped back within the relatively dust-free interior of the airlock compartment.

He checked his computer tablet. The last downloaded weather data projected the storm would recede from the station's vicinity within an hour. On a world where dust storms covered the globe for months at a time, that was hardly worth mentioning. Eric put away his tablet, and retreated into the dim stillness of the dome.

Bent over the corpse, a man stared back at him.

The newcomer slowly straightened up, until he was at least a head taller than Eric. He shifted on his feet and flexed his arms, muscular limbs bulging inside his mars-suit like the coilings of a python. The figure seemed to cast an aura of vitality that overflowed the room. Yet the expression beneath his helmet faceplate was blank, almost listless.

He held a single-shot pistol exactly like the one Nathaniel had given Eric. He had the barrel aimed at Eric's heart.

"So," said a monotone voice over the standard suit radio wavelength. "What do you think of the storm?"

The face above the gun barrel was frozen, drained of all emotion, unreadable.

"It's—" Eric felt his mouth go dry. "It's pretty thick."

"Yeah, never seen it this bad. Hope you don't have any friends stuck out there."

"Uh . . . a few, actually." To his own ears, Eric's uneven breathing dinned as loud

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as spoken words while his mind groped for a plausible story that might save his life: "We're traveling together as a group. I was riding in advance. They're right behind me. They should be here in just a few minutes, after the storm ends."

The man pursed his lips. "You're traveling with a group."

"Yeah, six—eight—of us."

"Eight. Well. That's interesting. But . . . you know what?"

"No . . . what?"

"I don't believe you."

The gun in the man's hand erupted a spear of fire.

Eric heard the boom as nerve-shattering thunder, the loudest sound he'd ever heard transmitted by the atmosphere of Mars. The ball hit him over the left breast, beneath the level of the shoulder blade. He felt like he had been impaled by a pick-ax. The impact knocked him backwards and spun him sideways. Pain seared his left torso.

He staggered against the wall and gaped at the front of his mars-suit. He saw no blood, no puncture, for the suit was a graphite composite, and almost bulletproof.

But not quite. The heads-up display flashed RAPID DEPRESSURIZATION in huge red letters. He couldn't see the cracks, but they were there—hissing his life away.

Doubled over and clutching the impact point, Eric leaned against the airlock frame and gulped quarts of air. He tried to think of what to do. It was hard . . . to think . . . .

"Suits are made of tough stuff, aren't they?" the man said. "Should have thought of that. Hold on, I'll shoot a hole in your helmet glass. Put you out of your misery a lot quicker."

The blank gray eyes regarded Eric, and then the man went back to loading another bullet into the chamber of the gun in his gloves.

Eric reached into his pocket, removed his own weapon, trained it on the man. He felt weak, but his arm did not shake.

"Stop," he said.

The other man looked up, saw Eric's gun, and froze.

"You're Swinton," Eric said, puffing. "Def Swinton, right?"

Pause. "Yeah."

Eric studied the face: wide-set eyes, a small nose, a smooth complexion. The features Nature had given Swinton did not suggest a murderer wanted on two planets. But then there were features that Swinton had given himself. The animated forehead tattoo of a fanged spider. The long cheek scar that modern plastic surgery could have easily fixed. The hollow stare above the slack jaw.

Swinton's eyes seemed to open into a vacuum, sucking in any human will that met their gaze. Eric looked to one side.

"Why . . . are you trying . . . to kill me?"

"It's you or me, buddy."

"What do you mean by—"

Swinton's fingers moved swiftly. He slammed the bullet into the chamber, closed the gun, raised the barrel—

Eric pulled his trigger first. The hammer struck the bullet. A soft clink.

Swinton aimed his gun and squeezed his trigger.

Eric dodged. Swinton's gun fired. The slug smashed into the wall behind where Eric's head had been.

Eric staggered through the airlock, into the dust storm. He picked himself up and plunged deeper, his only goal to get away from Swinton's third shot. He thought he'd run miles—and then, panting, he stumbled. The gun slipped out of his fingers and skittered and vanished into the fog of dust.

He raised himself to his knees. All he could see, everywhere, were clouds of dust, swirling and opaque.

The whole world had been erased, save for himself and dust.

The wind howled at one-third supersonic speed, a tornado on Earth but here . . . the tenuous atmosphere . . . even in Hellas . . . *nothing to do with Hell . . . ancient name for Greece . . . named by as-*

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tronomer Schiaparelli ... borrowed ancient and mythic geography—

Stay awake! Eric shook his head.

His vision was clouded, not only by dust but also splotches created in the faltering neuronic pathways behind his retinas. The world spun and he sucked ever-thinning air. A gust of wind knocked him onto his hands and he couldn't rise. He sensed the great black doors of the sensory universe swinging shut, forever.

RAPID DEPRESSURIZATION, the suit heads-up flashed. Fifty-three percent standard pressure ... fifty-two ... a vision of his mars-suit instructor speaking to the class: *If it drops below fifty, you lose consciousness, it's over.*

Fifty-one ... forty-nine ....

Wheezing, Eric moved his hands by rote. He twisted the emergency air bottle valve. Internal suit pressure increased, inflow exceeding outflow. He slapped repair tape onto his chest. He inhaled deeply, forced himself to calm.

Pressure at eighty ... ninety ... PRESSURE NORMAL, the heads-up reported in modest green letters. Eric put on more tape, just to be sure. Then he spent a moment staring at the ground, just to be sure that he was still alive.

On wobbling legs, he arose and looked around, turning slowly. He killed the headlamp, but removing the backscatter glare didn't help much. He saw little beyond the dust pelting his visor. No dome, no scooter. His boots were shadowy outlines.

He extended an arm, and the sleeve faded, the glove vanished. Earth had blizzards called white-outs, so thick a man could get lost walking from his front door to his mailbox. This was a red-out.

Eric looked down. He couldn't see the gun, anywhere. He could barely see his own legs. He got on his hands and knees again and crawled forward, thumping the ground. Finally his fingers hit something hard, and wrapped around the gun's familiar shape.

LOW POWER, the heads-up flashed.

Without power, his suit would go subzero at night and he would freeze to death. But he didn't need to worry about that. Without power, his suit couldn't recycle carbon dioxide into oxygen. He faced imminent suffocation. He needed to find the scooter, plug into its battery, recharge his suit—and drive away, blind if necessary, before the storm lifted and Swinton shot him.

But where was the scooter?

The tablet GPS still functioned. He wasn't lost. The position indication dot on the map showed he was still in Hellas Basin. Great ... but where was the scooter?

He tried to think. Despite his recollection of sprinting forever, the pressure leak rate hadn't given him the time to run more than thirty meters from the dome. He would have fallen unconscious and collapsed before that. So the scooter was still southward.

The GPS gave a compass reading. He walked south, counting paces.

Minutes of zigzagging later, buffeted by the raging wind, he began to feel it was hopeless. He wasn't even sure he was north of the scooter anymore. He might have walked right past it. There was no way of seeing through the dust more than a meter.

Stifling his growing panic, he realized he had to be methodical.

Eric sifted through his pocket. His fingers brushed the gun, the knife, the scooter key, the roll of suit repair tape.

He removed the roll of tape from its bag. He knelt down and wrapped the tape over and under a pillow-sized rock. Arising, he unspooled the rest of the tape, keeping it stretched and off the ground, until the entire roll was unwound. It came to about ten meters, he estimated from counting his backsteps. Holding the loose end, he swept a radian around the pivot of the now-unseeable rock.

Something snagged and tugged. Glove over glove on the tape, he inched toward the invisible object, hoping it would not be another rock.

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A handlebar poked his belly. Slumping in relief, he felt around to the dash, plugged the scooter power cable into his suit, and recharged from the scooter battery. The suit's LOW POWER message faded.

He swung astride the saddle and stuck the key into the ignition and turned the motor on—and drove but three meters before halting, a deep frown creasing his face. He rocked the scooter right and left, confirming the lightness. The loose articles in the trunk should have shifted with the tilting; they always had before. Yet he heard and felt nothing.

No, he thought.

He dismounted and flung open the trunk lid. The tent, his food, his air tanks, his solar charging pad—everything was gone, the compartment was empty.

Eric wanted to scream at the wind. Instead, barely, he regained control of himself. Then he tried to understand what he was up against, by reconstructing events from Swinton's view.

After escaping from his mining base in Cimmeria, Swinton must have lost his pursuers by wrecking the bridge at Dao Vallis. Then, Eric supposed, he had evaded phototelemetry satellite tracking by weaving in and out of the storm front. Thus it was no coincidence that Swinton and the storm had made their appearances at Low Point together. Likewise, the storm front had driven Eric to the same rendezvous. What seemed like improbability was in truth inevitability.

Nathaniel was right, Eric grimly thought. Sometimes, Mars could be a *very* small world.

Swinton must have come to Low Point Station to steal supplies. Eric had appeared, so he stole Eric's supplies too. Swinton would still want Eric's scooter, suit, and what little else Eric had on his person. On Mars, even the smallest increment of supplies might make the difference between life and death. So it had been for Swinton, and so it was now for Eric.

And rather than allow Eric to starve, freeze, or gasp to death long before rescue could arrive, Swinton had compassionately offered a mercy killing. Eric assumed the offer was still good.

Two mining cave-ins and countless suit leaks had taught Eric that neither panic nor fear was a solution. He visualized putting away his emotions like garments into a closet, and putting on the mental work clothes of cold, hard logic. He took steady breaths, and untensed his muscles. He still felt afraid, but he could think now, barely.

He stared at the gun in his grip, until an idea came.

In the midst of the maelstrom, Eric extended his radio antenna to maximum height and waited for comlink to be established.

CONNECTING PHOBOSCOMM, the tablet said. Not the relay on Phobos, but the comsat in shared orbit, which had finally risen to line-of-sight. Eric transmitted using the encryption key that Nathaniel had given him.

"Vulcan Metalworks Limited," Nathaniel's voice said, far away and muffled. "How may I help you?"

"Nathaniel, this is Eric Toshimi."

"Eric! So good of you to call! How are you today?"

"I'm—I don't have time to talk about it. This is really urgent. I—"

"To business then. Is there a problem you wish me to resolve?"

"The gun won't fire. I need to know how to make it work."

"The gun will not fire? Is there something wrong with the percussion mechanism?"

"No. The hammer hits the shell, but nothing happens. Just 'click.'"

The pause was so long, Eric wondered if the signal had been lost.

"I see," said Nathaniel at last. "Have you looked inside the barrel?"

Eric cursed himself. His head was still thick from the depressurization incident.

"I'm opening the gun—" Eric un-

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hinged the handle from the barrel, letting the bullet slide into his palm. The shell appeared undamaged—but a droplet of water rimmed the base.

"The shell may have gotten wet. Does that make a difference?"

"*Wet?* How did it get *wet?* We're on *Mars*!" Nathaniel was almost shouting. "How could it get *wet*?"

"Nathaniel, please! Help me!"

"... Yes, Eric. I did not think to make the cartridges waterproof, and getting them wet makes a difference. Had I but known ... well, it's best you use another one."

"I don't have any other bullets. And I need this one."

"... I see. Now, what is your situation there? You sound very—"

"Nathaniel, please—if I dry the bullet, will it still work?"

"Yes ... yes, I believe it will, Eric."

"How long will it take to dry—say, at just above freezing temperature?"

Silence.

"Checking MarsWeb ... no, there is no data of temperature versus drying time for gunpowder in the Martian environment. I did not think there would be. All I can tell you is the obvious: the warmer the faster, bearing in mind what happened to John Grant."

"Who?"

"Forgive me. You did not attend school in England, of course you would not know. John Grant was a conspirator in—"

"Nathaniel, please! I don't have much time!"

"I will be brief and pertinent. John Grant was a conspirator in the Gunpowder Plot. He dried damp gunpowder by an open fire and the powder exploded in his face. The moral is, you must exercise caution. But ... I would think it reasonably safe to hold the cartridge in front of your tent heater."

"I don't have my tent."

Silence.

The storm weakened, the dust settled. The sun peeked through, and Deimos winked toward meridian transit. Northward, thirty meters away, the dome's antenna mast emerged from the haze. The unveiling of the dome worked its way down. Eric watched as the top of the airlock came into view.

"Is there *any* way," Eric asked, "to get damp gunpowder to ignite?"

"Well," said Nathaniel, "that is again the lesson of our Mister Grant. If you have a spark that is hot enough and big enough, even somewhat damp powder will ignite. Though if the powder is too damp, it will only fizzle."

"How do I get a spark that's hot enough and big enough?"

"Eric ... it is you who knows the resources at hand."

Eric stared at the unveiling horizon.

"Yes," he said dully. "Thank you ... Nathaniel ...."

"Eric ... you are desperate?"

"Yes ...."

"I ... I shall pray for you."

Eric disconnected, letting the tablet slide out of his hand and sway in the wind at the end of its cable. When his numbness subsided, he looked toward the dome. He could see the entire outline of the airlock. Swinton, peering through the other way, would be seeing him.

LOW POWER, the scooter dashboard flashed. Now the scooter battery had gone low. He had been so intent on driving here, so much in a hurry to beat the storm, he hadn't recharged the battery in over a—

Battery, Eric thought. *Battery*!

He dismounted and knelt alongside the motor casing, prying off the cover. A pair of cables connected the battery to the motor. Eric started unscrewing the cables off the motor terminals.

He grabbed his tablet and tapped the recorder icon.

"David, this may be it," he said, trying to keep the stress from his tone. "Just want to say, I love you. Don't blame yourself. We had a plan. Should have stayed in the mines. Remember good times, re-

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member mom and dad. You and I weren't to blame for the accident, you're not to blame for this. Do good, make us proud—"

Eric's words caught in his throat and his eyes watered. Peering over the saddle, he saw the airlock disgorge the bear-like form of Def Swinton, swinging the other pistol. Eric repressed an urge to drive away. The confrontation had to come now—before Swinton could realize what Eric intended.

"Having trouble?" Swinton asked. Radio carried his voice over the distance and howling wind and into Eric's helmet speakers with a clarity that made it seem as if they were standing face to face.

Eric scrunched behind the scooter. At last, the battery cables came off the motor and he touched the ends together. The spark was smaller than he'd hoped.

"I counted the cartridges left in the ammo box I took out of your trunk," Swinton said. "You just have that one bullet, don't you? And too bad, it's a dud. I can sympathize, you know, 'cause that's the kind of luck I get most of the time."

Cursing the thick gloves, Eric cradled the breech, pushed in the bullet. He wedged one of the wires against the shell. *Now, slowly*—he raised the barrel to a level just below the top of the scooter seat, so that the gun was still hidden from Swinton's view.

"I just want you to understand something," Swinton said. "It's not me that's doing this. It's the authorities who are forcing me to grab any supplies I can, just to stay alive, and I gotta shoot people so they don't come after me. You understand? This isn't malice. This isn't my choice. It's the way Mars is. It's not me. It's this planet. Sitting on the edge of Hell. Sentences you to death—just for wanting to breathe!"

Swinton loped toward the scooter, his face devoid of expression despite the passion that had crept into his voice.

Eric turned the muzzle toward Swinton. With his free hand, he grasped the end of the other battery cable and brought it within an inch of the shell. He waited for Swinton to come as close as possible.

Swinton stopped a few steps away. The tips of his lips curled.

"Nothing personal," Swinton said. He raised his gun.

Eric rose faster—and smashed the wires together. A spark flashed, the gun boomed. Swinton screamed and staggered, clutching his helmet.

He still held his gun. Knowing well the size disadvantage, Eric leaped for Swinton's throat. Low gravity carried him the distance. But then, in the same low gravity, Swinton easily flipped and pinned Eric. Overcoming Eric's resistance, Swinton pressed his gun muzzle to Eric's helmet and coiled his finger around the trigger. Eric was certain that Swinton's grin would be the last thing he would ever see.

Then, eyes rolling, Swinton collapsed.

Little more than an hour later, Swinton revived. His eyes opened wide, then quickly narrowed to slits. He gazed through the half of his faceplate that wasn't covered with repair tape and saw Eric standing over him.

He lunged with sharklike speed.

The tape binding his wrists and ankles caught him with a jerk. He flopped back onto the station dome's floor. He stopped struggling when he saw the gun in Eric's hand, aimed dead center between the fugitive's eyes.

"It's reloaded," Eric said. "With a dry bullet."

"What . . . what are you going to do with me?"

"I've hidden your knife nearby," Eric said. "You should be able to find it and cut your bonds. You're not going anywhere, though. I found your truck by the back door, and I've disabled it. Your supplies should last until the authorities come."

"There are three warrants waiting for me back on Earth!" Swinton cried. "I'll be in prison for life, no parole! I'd rather die

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than be cooped up again!"

"I know the feeling," Eric said. "But I don't kill people over it."

Keeping the gun trained on the fugitive, he backed out of the dome.

Half a kilometer away, Eric crested a hill and stopped the scooter. The storm had abated, and he could make out the dome lights, the horizon, and even the cliffs beyond. The Sun had set, dusk had gathered, and the sky was deepening purple. A bright blue star, which every person on Mars knows well, beckoned in the west.

Miles to go before I rest, Eric answered the star, with a lightness that surprised himself. He checked his suit readings to make sure his spiritual buoyancy wasn't due to low oxygen. But no, everything was fine—with himself, his equipment, the whole world.

He plugged in his tablet. He had a message, audio only, from David.

"Hey, big brother," David's welcome voice said. "Sorry I haven't replied lately, it's been a madhouse with exams, but I'm hanging in there. Whenever I think I have it rough, I remember what you're doing for me. I can't imagine what the mines are like and I'm so glad you got out. I look at your pictures and wish I was cruising up there with you.

"Hey—remember telling me how everyone at your base was always saying you're on the wrong side of the planet? When I showed my fellow Earthlings your pictures, they asked, 'Where's Mariner Valley? Is that Mariner Valley? When is he going to Mariner Valley?' I guess that makes it official, you're on the wrong side of the planet.

"Well, back to the grind. I'll talk more later. Miss you, Eric. Take care."

Smiling, Eric examined the queue of messages he'd yet to send. He deleted the most recent entry, the one made during the storm. He uploaded the rest. Then he made a new entry:

"Hey, David. Got your message, thanks. I'm sure you're doing well in your studies. You always were the smart one.

"Don't feel sorry for me. Maybe some people come to Mars because they're running away from Earth, but I like it here."

He paused and gazed over the rocks and sand. No, he wouldn't tell David what had happened at Low Point Station. Not during exams. But as to what he felt just then—

"On Earth . . . I always thought I was the victim, of circumstances beyond my control. I guess some people still think that way up here, too, but that's not how I look at it. The way I see it, frontiers force you to take charge of your life. A frontier like Mars . . . it makes you feel like an individual . . . instead of a cog in somebody else's machine."

Then he remembered Earth's bureaucracies of snoops and censors. He overwrote his last words with: "Heading toward Noachis now. Maybe look for the Mars 2 site. Should be fun."

He raised his eyes to the horizon. The mines and their walls seemed as distant as darker memories of regimented cities. Breathing deeply, he added:

"And David . . . what matters is . . . for me . . . it's the right planet."

Eric uploaded, then gripped the handlebars and charged forward. Hitting a dry spot, his wheels sprouted a rooster tail of dust, which spread across the plain like a storm of his own. ■

A prejudice is a vagrant opinion without visible means of support.

—Ambrose Bierce

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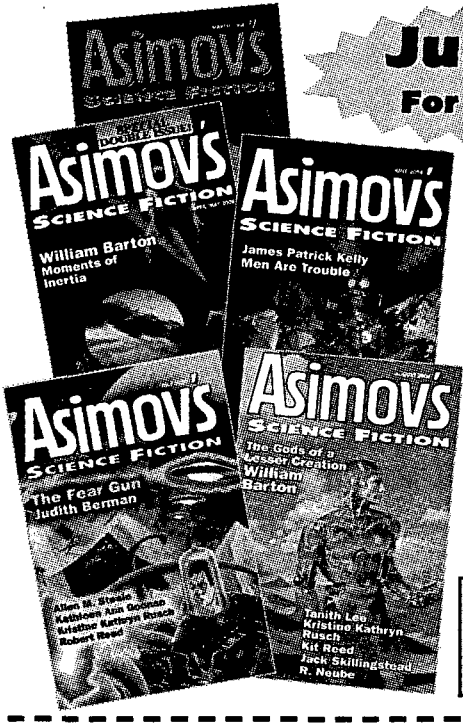

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Dark-Energy Stars vs. Black Holes

For three days in April, 2005, I was a speaker and panelist at the NASA-sponsored "Physics for the 3rd Millennium II Conference" in Huntsville, Alabama, where twelve of us, including two Nobel Laureates, were invited to give 50-minute lectures about cutting-edge physics to an audience of NASA engineers, teachers, students, parents, and other interested attendees. In this column, I want to tell you about the work described in one of the talks, given by Dr. George Chapline of the Lawrence Livermore Laboratory.

The issue that Chapline addressed had previously been brought into sharp focus in a science fiction story, Poul Anderson's widely reprinted "Kyrie", in which an intelligent energy-being falls into a black hole while in telepathic contact with a nun in a nearby spaceship. Near the event horizon of the black hole where time stops due to gravitational time dilation, the being is trapped in agony, presumably for all eternity.

If a collapsing star has enough mass, the star cannot be stabilized by repulsion from the strong interaction, and so it collapses to a black hole. According to Einstein's general relativity, as one approaches such a collapsed star, the increasing gravity field causes time to slow down until, on a surface called the "event horizon," time stops altogether and an infalling object "freezes" there. Curiously, the general relativity description of a fall through the event-horizon depends on the situation of the observer. As viewed by an outside observer, time effectively comes to a halt for the infalling object, so that it appears to freeze at the event horizon. However, from the viewpoint of the unfortunate observer who is falling through the event horizon and into the black hole, nothing unusual happens as the event horizon is crossed except that contact with the external universe is cut off.

Chapline argues that it is unreasonable that time comes to a halt in the external reference frame, while producing no observable consequences in the infalling observer's frame. He suggests that quantum effects should become important near the event horizon.

This suggestion goes against the conventional wisdom. Since the 1950s, there has been a general agreement among the physicist practitioners of general relativity that quantum effects should become significant *only* at very small distance scales, and that quantum mechanics can be comfortably ignored elsewhere. Chapline raises objections to this rule. He argues that the infinite time dilation at the event horizon of a black hole creates a situation in which quantum effects are needed, even though it is a macroscopic system. Further, he points out that quantum mechanics (which in its current formulation is not compatible with general relativity) *requires* some universal time standard, so that clocks can be synchronized and cross-referenced everywhere in a system. The behavior of time near the event horizon prevents such synchronization. If general relativity tries to stop the clocks,

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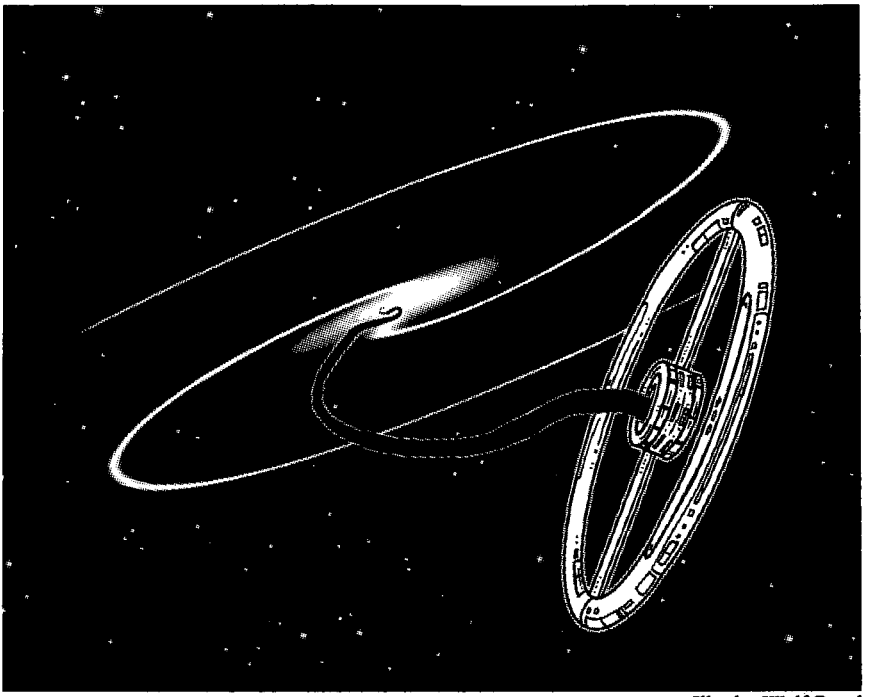

Illo. by Wolf Read

Chapline argues that quantum mechanics will "fix" this problem by producing a phase transition in the infalling matter as the event horizon is approached.

To decide what should happen when quantum mechanics takes over, he considers an analogous situation, well described by quantum mechanics, which occurs in a vertical column of superfluid helium that has more pressure at the bottom than the top of the column due to the weight of the upper liquid. In such a situation, there is some particular vertical height at which the speed of sound in the liquid goes to zero. The sound waves encountering this zero-sound-velocity "barrier" should behave in a way that is analogous to the black hole situation in which the infalling particles attempt to cross the infinite time dilation barrier.

In the superfluid case, when the sound waves come within a critical distance of the barrier, two things happen. First, the relation that the product of frequency times wavelength equals wave speed breaks down, and second, waves above a certain frequency become unstable, and their energy is dissipated in the liquid. Chapline suggests that a similar scenario should happen near the event horizon, and that in particular, the infalling particles, as they approach the event horizon, will become unstable. First the heavy particles like protons will decay into lighter particles like positrons and mesons, and then the quarks and leptons themselves will dissipate into the vacuum, raising the energy of the vacuum as they become "dark energy." In other words, he hypothesizes that inside the event horizon, there are no particles, but only a dark-energy region where the cosmological constant is much larger than it is in the external world.

As we have discussed in previous columns (for example, "Our Runaway

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Universe and Einstein's Cosmological Constant", *Analog*, May 1999), in general relativity, the dark energy of the vacuum creates a negative pressure that drives the accelerating expansion of the universe. Behind the event horizon, in Chapline's scenario, the accumulating dark energy would create a large negative pressure that stabilizes the star, so that it never becomes a black hole, as that label is presently understood. Instead, the collapsed object becomes a dark-energy star.

Therefore, according to Chapline, there are no black holes in our universe, only dark-energy stars that contract to some definite size at which they are stabilized by the negative pressure of the dark energy inside. This provides a new mechanism that prevents a collapsing star from progressing all the way to an information-destroying singularity. Instead, the phase change to dark energy would produce a stable system of finite size, with no singularities to worry about. Further, the supposed "evaporation" of black holes by the Hawking radiation process (which has never been observed) does not happen, because the quantum processes manifest themselves in a different way. It's also interesting to note that the supposed thermodynamic connection between string theory and the surfaces of black holes, which has recently been publicized as a great triumph for string theory, may be based on questionable physics.

Is there any evidence that the Chapline view of collapsed stars is correct? Perhaps so. There have been several space-based X-ray and gamma ray telescopes launched in recent years, and the resolution and sensitivity of these instruments has been improving, year by year. When these instruments look in the direction of our galactic center, they observe a remarkable and puzzling thing. There is a stream of antimatter electrons, the so-called "Positron Fountain," coming from the galactic center region and producing a large quantity of 511-keV annihilation radiation there. This is probably related to another observation, of the population of charged particles in cosmic rays, which show that above a certain energy (~500 MeV) there is a definite excess of positrons over electrons in the population of charged particles reaching the solar system. These preferences for positrons are a mystery, since fundamental interactions, e.g. electron-positron pair creation, produce matter and antimatter electrons in an even-handed way, favoring neither one nor the other.

Chapline suggests that these positron-favoring phenomena are the result of enhanced proton decay as the particles become unstable near the event horizons of dark-energy stars. In the 1980s, there were predictions from grand unified theories that the proton might be intrinsically unstable, and that in the fullness of time it might decay, for example, to a positron and one or more pi mesons. Subsequent experimental attempts to observe such decays have failed, thereby falsifying the simplest versions of grand unification theories and setting fairly low upper limits on the probability that a proton might decay in vacuum. However, in the vicinity of an event horizon, Chapline suggests that the decay rate of the proton is greatly enhanced, so that there is a much higher probability of proton decay. Some fraction of the positrons from such decays, particularly those with high energies, should escape the strong gravity field of the collapsed star, perhaps accounting for the observed positron cosmic ray abundance and the positron fountain at the galactic center. Chapline also makes the case that destabilization of infalling matter could account for the energy distributions observed in gamma ray bursts.

Chapline further suggests that the dark matter in our universe might be an artifact of the same physics. Perhaps our normal vacuum is already close to the quantum transition point between nor-

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mal vacuum and the dark energy continuum, with dark matter showing up in the vacuum because of the close proximity to the transition conditions. His papers are not specific enough to convince me that this would have the properties needed to account for the concentrations of dark matter near galactic clusters, but it's an interesting idea.

However, we might ask whether all of the recent publicity about the "observation" of black holes at the centers of our own and other galaxies contradicts these ideas. Doesn't the observation of black holes preclude the existence of dark-energy stars?

No, it doesn't. The label "black hole" is now conventionally attached to any collapsed astronomical object heavier than a neutron star. The observations mentioned concern the accelerations of nearby stars and the existence of an accretion disk around the objects. Necessarily, there is no observational evidence of what lies inside the event horizons of the objects. Thus, the astronomical observations would be consistent with either a black hole or a dark energy star.

Since this is a science fiction magazine, let's suppose that Chapline is correct and consider the SF implications of his new twist on collapsed stars. First, all the SF that involves penetrating through the event horizon of a black hole is invalidated. For example, Fred Pohl's Heechee in his *Gateway* series would not have been able to burrow behind the event horizon of an assembled low-tidal-force black hole, because when they approached the horizon, the Heechee populace would be converted into dark energy.

But it does bring up some interesting questions. Suppose that by some mechanism (a wormhole?) one could reach the interior of a dark-energy star. How does the flow of time work inside the event horizon? Would the interior be a completely hostile environment? Could matter exist inside, if it didn't have to come in through the event horizon? Would the high cosmological constant there induce a "Big Rip" in any matter present? Would the laws of physics there be those we understand? Could one "drain" the accumulated dark-energy through a wormhole and use it as an inexhaustible energy source?

Perhaps, if Chapline's ideas can withstand observational tests and theoretical scrutiny, we may learn the answers to some of these questions.

AV Columns Online: Electronic reprints of over 120 "The Alternate View" columns by John G. Cramer, previously published in *Analog*, are available online at: http://www.npl.washington.edu/av. The preprints referenced below can be obtained at: http://www.arxiv.org.

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Every man is dangerous who only cares for one thing.

—G. K. Chesterson

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Probability Zero

The Genetics Lecture

Harry Turtledove

It was lovely outside, too lovely for the student to want to stay cooped up in here listening to a lecture on genetics. The sun shone brightly. Bees buzzed from flower to flower. Butterflies flitted here and there. The air smelled sweet with spring.

And the professor droned on. The student made himself take notes. This stuff would be on the midterm—he was sure of that. Even so, staying interested enough to keep writing wasn't easy.

If only the prof weren't so . . . old-fashioned. Oh, he was impressive enough in a way: tall and straight, with big blue eyes. But his suit wouldn't have been stylish in his father's day, and those glasses clamped to the bridge of his beak. . . . *Nobody* wore those any more. Except he did.

"This complex of Hox genes, as they're called, regulates early bodily development," he said. The student scribbled. However old-fashioned the prof was, he was talking about stuff on the cutting edge. "Like all insects, the fruit fly has eight Hox genes. The amphioxus, a primitive chordate, has ten."

He picked up a piece of chalk and drew on the blackboard. "The amphioxus is sometimes called a lancelet from its scalpel-like shape, which you see here," he said. "In reality, the animal is quite small. Now where was I? Oh, yes. Hox genes."

"All animals seem to share them from a long-extinct Proterozoic ancestor. There is a correspondence between the orientation of the gene complex and the animal. The first Hox gene in both the fruit fly and the amphioxus is responsible for the head end of each animal, the last for the abdomen and tail, respectively.

"And let me tell you something still more remarkable. We have created, for example, mutant fruit flies that are eyeless. If we transfer this *eyeless* gene to an amphioxus, its progeny will be born without their usual eye spots. Note that

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the normal expression of the gene, as we say, is vastly different in the two animals. The amphioxus has only light-sensitive pigment patches at the head end, where the fruit fly has highly evolved compound eyes."

"What about us, Professor?" another student asked. "Why are we so much more complex than fruit flies and the waddayacallit?"

"The amphioxus?" The professor beamed at her. "I was just coming to that. We're more complex because our Hox genes are more complex. It's that simple, really. Instead of a single set of eight or ten Hox genes, we have four separate sets, each with up to thirteen genes in it. The mutations that give rise to this duplication and reduplication took place in Cambrian and Ordovician times, on the order of 400,000,000 years ago. We are what we are today because our ancient ancestors suddenly found themselves with more genes than they knew what do with." He beamed again. "Animal life as we know it today, and especially the development of our own phylum, would have been impossible without these mutations."

That intrigued the student almost in spite of himself. When the lecture was over, he went up to the front of the classroom. "Ask you something, Professor?"

"Of course, of course." Even with those silly glasses, the prof wasn't such a bad guy.

"Mutations are random, right? They can happen any old place, any old time?"

"On the whole, yes." The prof was also cautious, as a good academic should be.

"Okay." That *on the whole* was all the student needed. "What if, a long time ago, these Hox genes got doubled and redoubled in arthropods instead of us? Or even in, uh, chordates instead of us?" He was damned if he'd try to say *amphioxus*.

"Instead of in us mollusks? I think the idea is ridiculous—ridiculous, I tell you. We were preadapted for success in ways this sorry little creature's ancestors never could have been." As if to show what he meant, the professor reached out with one of the eight tentacles that grew around the base of his head, snatched up the eraser, and wiped the picture of the lancelet off the board with three quick strokes.

The student flushed a deep green with embarrassment. "I'm sorry, Professor Cthulhu. I'll try not to be so silly again."

"It's all right, Nyarlathotep," the professor said gently—he did calm down in a hurry. "Go on now, though. Have a nice day." ■

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Infinity's Friend

Dave Creek

Communication barriers can be considerably subtler than language barriers. . . .

Matt Christian was guiding his skimmer down toward an active volcano jutting up from the planet Welkin's ocean when Sarbin contacted him over the datalink to confess he'd beached himself again.

Matt shook his head in frustration as he halted the skimmer's descent well short of the looming plume of the volcano's smoke and ash; as much as he admired the Aquatile, this was becoming a bad habit. "Can't you make it back into the water?" he asked.

Matt envisioned his native friend much as he'd discovered him twice previously—his broad, walrus-sized body flopped over onto its back, stubby arms flailing, wet round eyes taking in the brilliant, moonless night sky and all its wonders (the name Welkin meant "arch of heaven").

"I'm sorry, Matt. I cannot," Sarbin said. "The stars above—they were so wonderful, and I cast myself high upon the shore so the waves wouldn't pull me back. But it was too far."

Matt understood the pull the stars exerted upon Sarbin—that same pull had brought him to this planet, after all.

He cast a wistful eye down at the volcano—any secrets it possessed as to how Welkin had formed with so little land area would remain hidden a while longer. He eased the skimmer back the way he'd come, toward the spit of land, not a kilometer across, that Sarbin favored for his contemplation of the stars.

Then he thought of something. "Sarbin."

"Yes, Matt."

"How long have you been beached?"

"I . . . don't w . . . want to tell you."

Matt wanted to pound the control console before him, as he realized the datalink translation was passing on hesitation in Sarbin's voice. Was it just nervousness, or was Sarbin finding it more difficult to speak? Matt forced himself to remain calm. "*How long?*"

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After a pause, Sarbin said, "A . . . couple of hours. And the sun will be coming up soon." Matt stifled a curse. This beaching had become an immediate danger, not just an inconvenience. The Aquatile, though an air-breather, could not remain out of the water for long. Removed from the ocean, Sarbin's slick skin would quickly dry out and crack, even on a cool, humid night. Gravity's pressure would strain his muscles and could even rupture his internal organs.

Yet he'd taken this chance again!

When Matt checked and saw how long it would take him to return to that tiny island half a world away on Welkin's nightside, he felt grief and regret over Juliette's death five years earlier wash over him anew. "Sarbin, I may not make it back there in time. Is there *any* way you can return to the water?"

"I . . . have tried, Matt. I'm exhausted. Outside the water . . . it's so tiring."

"Even at this skimmer's top speed, it's going to take me the better part of an hour to reach you. And . . ."

"And in an hour," Sarbin said, "I could well be dead. I understand."

Matt muttered, "Sarbin, I will *not* put myself in that position again. You have to hold on."

Sarbin didn't speak again for a moment, and Matt wondered if the Aquatile had fainted, or worse. Then Matt heard, "What do you mean 'again?'"

Matt didn't say anything. He busied himself with the skimmer's controls and checked its trajectory again.

"Matt?"

"I'm here, Sarbin."

"What did you mean?"

Matt said, "I was . . . just wishing I had someone else from the crew here to help out."

He was a contact specialist aboard the Earth Unity exploratory craft *Haldane*. That craft was in the outer system exploring some interesting-looking gas giants. He'd promised Captain Blackwell he'd be careful while here on Welkin alone. Besides, he'd told her, the skimmer had a fully equipped nanodoc program. What could go wrong?

Now he knew. He said a brief, silent prayer for Juliette's soul. The Seventh-day Adventist beliefs they and the rest of the population back home on Pitcairn Island shared had been another bond between them. He hoped he wouldn't soon be saying a similar prayer for the soul of his Aquatile friend. That Sarbin had one, whether he was aware of it or not, Matt never doubted.

For now, though, the Aquatile was telling him, "If anyone can rescue me in time, you can. After all, you're infinity's friend."

Matt suppressed a groan. The very concept of "infinity" had been one of the most difficult to explain to a being he'd originally thought of as "confined" to an ocean. Once he'd taken a few swims with Sarbin, and followed him into the deeps of that ocean in *Haldane*'s small submersible a few times, he'd learned better than that! If an environment was much larger and varied than an individual could explore in a lifetime, wasn't it, in practical terms, "infinite?"

Sarbin, though, had eventually grasped the concept, understanding that when he was lying on the beach staring at the stars, he was staring at the equivalent of more oceans than any one being could even count in a lifetime, let alone explore.

"Sarbin," Matt said, "tell me how you're doing."

"As well as could be expected. The more you speak to me, the better I am."

"I'm growing closer with each moment."

"Matt, I was just remembering the days when we first met."

"That's a fond memory for me, as well." And much preferable, Matt thought, to dwelling on a previous tragedy.

He and Sarbin had spent the first few days after Matt's arrival on Welkin fine-tuning the translation tech. Sarbin's

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datalink was implanted next to the two small bones at the back of his head that produced the clicks and low tones that were Aquatile speech. Those sounds were feeble whenever Sarbin was out of the water, though, and the link had to amplify them for transmission. Submerged, Aquatiles could communicate for many kilometers.

With Sarbin beached, however, that ability was useless to him. And no other Aquatile had yet agreed to an implanted link, so Matt couldn't call for help, either.

Sarbin said, "Do you remember the first time you spoke to me when part of me was sleeping?"

Despite himself, Matt smiled. "We were swimming together, just a couple of days after we'd met," he said. Matt remembered how new everything on Welkin seemed to him then—the freshness of the air, the lighter .85 grav, and especially Sarbin. Matt had had little contact with other Galactic species other than the occasional Kanandran or Arol.

Sarbin, with his sad wide eyes offset by his dolphin-like eternal smile, was an endless fascination to him, an otherworldly manifestation of the passage from Romans that referred to "gifts differing according to the grace that is given to us." Certainly Sarbin's gifts differed greatly from a human's, and were perfectly suited to his environment.

The Aquatile's arms, so weak on land, along with the singular fluke of his muscular tail, could propel him through the water with a shark's swiftness. The two of them were swimming together one day, well within sight of the strip of land where Matt had landed his skimmer. Sarbin was amused at Matt's breather mask, with its nanotech that extracted breathable oxygen right from the ocean's waters. "We're both mammals," Sarbin said. "And I don't need a breather."

"I can't go without breathing for more than a few minutes, either." Matt knew Sarbin could take deep, deep breaths into his broad chest and remain underwater for nearly an hour if he wished.

Sarbin said, "I want to visit Earth."

That was a surprise! Matt said, "I never knew that you thought about—"

Sarbin interrupted Matt. "I want to go right now. Wait—there it is. Just land. Hardly any water anywhere."

"Well, actually, most of Earth's surface area is—"

Sarbin interrupted again. "I could grow legs. I could walk on earth . . . on the Earth as you do."

Matt stopped swimming to tread water while he tried to figure out what was wrong with his friend. "Sarbin, you seem confused. What can I—"

Then the Aquatile's fluke flipped toward the sky and Sarbin was gone—Matt could just make out his body's form flashing through Welkin's waters before losing sight of him. Matt swam back to the tiny island and sat on the small strip of beach, waiting. After the first hour, he began to pray. Where had his friend gone so suddenly, and would he ever return?

At the end of those two hours, he did. Matt splashed into the water and embraced Sarbin. "I was afraid I'd never see you again!"

Sarbin's eyes grew even wider and the vertical slash of his single nostril opened and closed rhythmically. He took Matt by the shoulders and gently but firmly broke the embrace. "Why were you concerned?"

Matt was puzzled; even through the translation, he sensed a lack of affect in Sarbin's words. And that business of refusing his touch—Matt walked up onto the shore again and sat.

Sarbin said, "You look as if you have never spoken to someone who is asleep before."

That's when Matt realized what was happening. "The two halves of your brain take turns sleeping!" He felt foolish for not realizing that sooner. Dolphin brains back on Earth pulled the same trick—part of their consciousness had

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to be awake constantly, otherwise they risked "forgetting" to swim, and could sink and drown.

"Which half was I speaking to earlier?" Matt asked. "You weren't making a lot of sense. And when you swam off like that—I was worried."

"You shouldn't have been. If a real danger had been present, that side would have come awake. You were speaking to the part which controls emotions and conjures up ideas."

"In humans," Matt said, "that would be the right brain."

Sarbin slid up onto the beach, but not so far that his stubby arms couldn't push him back into the water again. "In Aquatiles, I am not certain. The particular idea the emotional half mentioned, visiting Earth, is not one this side of me would consider."

"I'd take you there if you ever wanted to go."

"Then perhaps this logical half's objections will be overcome. So, tell me how human brains control their sleep patterns."

"Both halves of our brains sleep at the same time."

For an instant, Sarbin's gaze lifted upward in thought, as his lips, three times the length of a human's, pressed together. All in all, an oddly human expression. "Interesting," Sarbin said. "I wondered why, when you would say it was time to sleep, that you would excuse yourself and enter your skimmer. I would imagine sleep is a vulnerable time for you. Did you fear I would harm you?"

"Sarbin! Never! It's just that my species prefers quiet and darkness while sleeping."

"Do not feel offended at my suggestion. Remember you are speaking to the purely logical side of me. No doubt my emotional half recognizes that you are benign, and in fact appear predisposed to my welfare."

Matt, remembering that as he piloted the skimmer to rescue Sarbin, frowned the same way he had that day. Benign, huh? he thought. Though I suppose it's better than being some sort of alien menace.

"Matt," Sarbin said. "I'm worried."

"I'll be there within twenty minutes."

"The sun is coming up."

Matt knew how difficult it was for an Aquatile to withstand direct sunlight. Sarbin's skin would dry out more quickly, and his eyes, adapted to the deep ocean, often found sunlight blinding. Aquatiles had little reason to scan daylight skies, and the only reason Sarbin ever beached himself was to be able to contemplate the stars at night.

The first time Matt had discovered Sarbin lying on his back on dry land, he'd admonished him not to do it again, and Sarbin had promised he wouldn't. Matt hadn't believed him.

Just a week later, Matt was nearby as Sarbin pulled himself onto the shore of the tiny island and flopped himself over. In a sense, it was a moment of pure wonder for Matt, as if he were seeing the Welkin equivalent of life first emerging from the sea onto its new home, the land, just as it had happened upon the Earth. Never mind that the image was more metaphorical than literal; Sarbin was a large sentient being, not the slimes and molds that would have been the first travelers from Earthly seas onto the land. Matt had yelled at Sarbin again, but he'd feared the lesson hadn't sunk in.

And now Matt's worst fear was coming true. "You have to concentrate, Sarbin. Keep talking to me."

Sarbin didn't answer for a moment. When he finally replied, his confusion was apparent even over the translation. "Is that to help me, Matt, or reassure you?"

Matt ran his hand through his hair. "A little of both, I guess."

"I have little to talk about except my own pains and fears."

"Pick something else. Some story passed down through your pod, or something."

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"Such stories usually involve dodging sharptooth or avoiding being entangled in trapweed. Or failing to dodge or avoid."

"Dammit, Sarbin!"

"*You* tell a story. Tell me what you meant about being in this position again."

Matt said nothing, only made another position check. Less than ten minutes away, he thought. Dear Lord, don't let me be late . . .

"Matt. Please."

He tried to keep the growing impatience out of his voice. "What is it?" he asked Sarbin.

"Tell the story. For me, in what could be my final moments."

The skimmer's nav display showed the tiny island just on the horizon. With max magnification, Matt would even be able to make out Sarbin soon. "I never talk about it," Matt said.

"If it's something secret, it may die with me."

Matt considered. "You'd forgive me for something that happened years ago?"

"Just as I forgive you in advance if I die before you arrive."

"*Don't* say that."

"Then tell me."

"I was thinking of my twin sister. Juliette."

"I didn't realize you had a twin. Our current situation reminds you of her?"

Matt thought of Sarbin lying helplessly on that small stretch of land, with only the stars for company.

"Throughout our childhood, we spent many a night together behind our home on Pitcairn Island."

Sarbin interrupted. "You did not live on one of the large land masses you described to me?"

"Hardly. Pitcairn is home to only a few dozen people. Many of our ancestors were mutineers, come to live far from other humans. Juliette and I, we would sneak out of our rooms on many a night and lie on the ground. We'd stare outward into clear, starry skies. We couldn't grow up quickly enough. We awaited wonders beyond measure. And each of us promised the another that no matter what, no matter who we married, we'd also explore the galaxy side by side, partners forever."

Sarbin said, "But that didn't happen."

"We were only twenty-two years old, not spacers yet. But an expedition to Earth's south pole needed a shuttle pilot."

"A skill you had."

"But Pitcairn's so remote. No maglev trains go there, there's no starport."

"I don't understand those references, but I perceive the problem."

"Our people had one skimmer among us, and no other transportation off the island. I took the idea to our parliament. They agreed I could leave as long as I came back right away if the skimmer was needed."

Sarbin said, "And when you left . . ."

"Just days after I arrived, the expedition was stranded on an ice shelf that came under a snow squall. Do you understand what that is?"

"I've never seen one myself. But others of my pod have described them to me."

Another position check. Matt said, "I'm so close now. Just a few minutes."

"You have to speak quickly, now. I . . ."

"Keep calm. The more excited you get, the more energy you use."

"My . . . logical half is losing consciousness. My emotional half is all that . . . is listening."

Was that possible? Matt wondered. Could this being have that much awareness of his own mind? "*Sarbin.*"

"I'm so frightened. *Tell* me the story."

Matt blinked away the beginnings of tears. Were they for Juliette five years ago, or for his helpless friend right now, whose fate was still open? "Juliette fell ill."

Sarbin asked, "What happened?"

"The doctor back on the island said she had food poisoning."

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"And you couldn't leave because of the squall."

"The expedition's shuttle could have lifted, but it was designed for transporting cargo, not for a long-range journey."

"And your island's skimmer?"

"Couldn't lift out of the storm. I wanted to try it anyway, but the expedition leader wouldn't let me."

Sarbin asked, "And your twin sister?"

"We didn't have modern medicine. No nanodocs. The doctor made a mistake. Juliette actually had a ruptured appendix."

"I'm sorry, Matt, that didn't translate."

"A vestigial organ attached to our colon. Such a rupture is rare. I got to talk to Juliette over the net. And . . . what she said to me was so terrible."

"She blamed you because you couldn't reach her?"

"Not at all. She told me there was nothing I could have done. She told me I was following our dream, and that I should keep following it no matter what. Sarbin, I'm only about a minute away."

"You *have* to keep talking. I can't stand just to lie here."

"Sarbin—I see you now." Matt set the skimmer's autopilot to make the landing on its own.

"I . . . can hear the skimmer. Matt—I feel myself slipping away. If you don't—"

"Shut up!" Matt said as he grabbed a portable nanodoc kit. I *will* make it!"

"Juliette was right. You should listen to her."

"She's dead," Matt said, as he strained to keep his voice from cracking with grief both remembered and anticipated. "Part of me died with her."

"Your brain must be addled from keeping both sides awake all the time. You have it backwards. . . ."

Matt was out of the pilot's chair and punching the control that lifted the skimmer's hatch even as the craft settled onto the island's surface. He swung himself down onto the beach with one hand while clasping the medkit with the other. He blinked against wind-blown sand and the sun's glare on the horizon. He could just make out Sarbin's arms and his fluke from behind a low rise. Matt ran toward his friend. "What do you mean, Sarbin? What's backwards?" I don't care what he meant, Matt thought. I just have to keep him talking.

He topped the rise, and Sarbin's form was still. His eyes stared unseeing into clear skies.

I never got to see Juliette's eyes again, he thought. By the time I arrived for the funeral, she was lying in her coffin with her eyes closed.

Matt didn't hesitate. No use taking a sensor reading or trying to inject nanodocs. He has to get back into the water, he thought.

Sarbin was only about ten meters from the water. A shallow channel showed where he'd dragged himself onto the beach. Matt tossed the medkit onto the beach. Then he pulled off his shirt and dipped it into the ocean waters, went back to Sarbin, and squeezed the shirt over Sarbin's body. The Aquatile's skin soaked up the water like a sponge. Matt did that a couple more times, then slapped the wet shirt onto Sarbin's body.

Then he grabbed the Aquatile's fluke and pulled—to no effect. His body didn't move even a centimeter.

Okay, Matt thought. Different tactic.

He went to Sarbin's side and tried to roll him toward the water. His spirit leapt when the Aquatile's body turned over, but fell when Sarbin's outstretched arms dug into the sand.

Help me, Lord, Matt thought. I need all your strength now.

He grasped Sarbin's fluke. The Aquatile was too heavy to pull straight back, but yanking him first to the right, then to the left, let him make a zigzag path toward the water.

Progress was slow but steady. Matt had to hope the moisture from his shirt gave his friend a fighting chance. Within three minutes, he had Sarbin in the wa-

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ter. He cradled the Aquatile's head in his lap to keep Sarbin's face above water. Ocean waves lapped against his chest and water splashed his face.

Sarbin's eyes blinked, and he came to awareness. "I knew you would arrive in time."

Matt grabbed the medkit from where he'd thrown it and took a reading, holding his breath the entire time. When the kit told him Sarbin's condition, he smiled. "You're going to be fine with some rest and a good meal." Matt patted Sarbin's side. "Your logical side wasn't really asleep, was it?"

"I'm sorry I misled you. But you are only infinity's *friend*, Matt. You are limited, as am I. I *did* need to hear your story. But I knew my emotions would suppress yours until it was right for you to express them. It is time, my friend. Part of you did not die with her. Part of her stays alive within you."

Matt set aside the medkit, held Sarbin tighter, and wiped away the salty moisture stinging his eyes, unknowing and uncaring whether it was sea water or tears and recalling that whenever he'd looked into Juliette's eyes, he'd always had the feeling he was looking into his own.■

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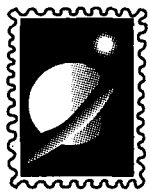

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Smiling Faces in Hog Heaven

Stephen L. Burns

There are some jobs for which employers don't *want* too much intelligence—artificial or otherwise!

Jamal Warren stepped off the warm bus into the damp chilly morning air, cold mist off the Chesapeake twisting through the amber-tinged glow of the streetlamps. The blue denim bib overalls, red and white checked shirt, and red white and blue string tie he wore were not fashion choices very many urban black twenty-somethings would call bang, even if they worked for the same company and were also headed for another day in the fast food trenches. The baggy purple Orioles warm-up jacket and purple and black leather mac were worth a few style points, almost making up for the shirt and tie.

It was just a few minutes before five in the morning, the streets of the waterfront area of downtown Baltimore still mostly deserted. Jamal was, as with most mornings, more or less awake and pretty much over the glum resignation it took to disentangle himself from the embrace of his girlfriend Jenna, crawl out of a warm bed, make himself dress like a fool, and shamble off to work. After fourteen months as Breakfast and Lunch Manager, this rite had become a sort of numb rut.

One that he often reminded himself sure beat ending up in a different kind of uniform in the endless bloody quagmire in the Middle East, or going into street-corner trade only to end up getting fitted for an orange jumpsuit, both fates which had befallen a lot of people from his part of town.

He wasn't expecting anything other than the usual hassles a normal business

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day would hand him as he stepped off the bus. But when he saw Bix standing outside the steel-bound, bulletproof glass faux barn doors of Farmer Fatback's Hog Heaven, his managerial antennae twitched uneasily, and he put some hustle in his steps.

Bix was his main morning man and biscuit cook, a tall and gangly white kid who'd come to him after a stint working as doughboy for a pizza chain. He hunched over a cup of takeout coffee like a dejected scarecrow, visibly shivering inside the thin bowling shirt he was wearing as a jacket.

"What's up, man?" Jamal called as he approached, his subtle managerial way of asking, *Why aren't you inside and working?*

Bix—whose real name was Gaylord Powder—shrugged and rolled his bloodshot eyes. "Don't know, dude. Can't get in."

Where another managerial type might have immediately leapt to the conclusion that the problem was entirely the employee's fault—even when it wasn't—Jamal knew how utterly dependable Bix was for a gamedroid. Always on time, never forgetting his ID, or to make sure he'd be able to pass the pigs.

Sure enough, Bix held up his Farmer Fatback Hired Hand ID card and mumbled, "Had me a bunch of bacon last night." The strip along one side of the card glowed, showing it was active and valid. "The real stuff. Like half a pound."

"Well damn," Jamal muttered, checking his own ID. "Maybe it's the pigs." He raised his voice. "Manager Jamal Warren. Pig Systems Check."

A hearty *oink!* came from inside each of the two cow-sized, bib-overalled, grinning concrete pigs flanking the entrance to the restaurant, signaling that all systems were operational. Each porcine effigy housed sophisticated devices that not only read the signals coming from the cards, but also collected and disassembled their body odor seeking proof that they had eaten pork products in the past forty-eight hours, thereby proving they weren't vegetarians or Muslim fanatics. Both of them should have passed this test, and thanks to the permissions on their IDs, been let inside the restaurant.

"It's gotta be Clem's fronked up, right?" Bix said. Now his teeth had begun to chatter.

"Looks like." Farmer Fatback's was one of the most highly automated and cyberneticized chains in America, and he raised his voice to address the AI that ran the building and was the ticking heart of every facet of day-to-day operations.

"Clem? It's Jamal. Are you there?" That was the AI's name. Every Hog Heaven was run by an AI named Clem, and they were all at once separate individuals, and part of some weird collective Clem. As a rule Clem was as reliable as Bix, his glitches minor annoyances at worst.

"Good morning, Jamal." Clem's tone was sepulchral, his voice seeming to come from everywhere and nowhere, produced by quarter-sized soundpods all over the property. Once the restaurant was open, the air would be filled with the muted, banjoic strains of blandly generic hillbilly music as interpreted by computers and drug-addled session musicians in LA.

Jamal felt a whiff of relief that Clem was responding, but getting this gloomy *Good morning* rather than the chain-mandated *Howdeee!* was not a good sign.

"So why aren't you letting Bix and me in, Clem?" he asked mildly.

"Because there is a problem, Jamal."

"With the building?"

"No, the building is fine. All infrastructure checks out perfectly."

Jamal sighed. Clem was in one of his literal moods, only answering what he was asked, and acting like a Mirandized street-corner pusher when it came to volunteering useful info. He glanced at Bix, who had begun flapping his arms and stamping his feet in an attempt to

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keep warm. His own fingers were going numb as the chill settled in.

Whatever it was giving Clem a bug, it sure wasn't from the Farmer Fatback Franchise Operations Bible, a book he knew by heart.

"Well, Clem," he said, slipping easily into the fake country drawl all Hired Hands were supposed to use while on duty. "I'm sure we can jaw out whatever problem it is you're having. In case you haven't noticed, we're freezing our butts off out here. Is there any reason we can't come inside?"

There was a pregnant pause as Clem considered this request in light of the glitch in his cybernetic gitalong, and no doubt consulted its own virtual version of the FFFOB.

"I guess not," was his grudging answer. The doors clacked and clanked as various locks, alarms, and self-defense devices unlocked, went on standby, and stood down.

"Thanks, Clem." He hitched up his overalls as the doors opened before them, readying himself for the task of wrestling Clem into letting him get his restaurant open on time.

"I've never been this late getting my biscuits started," Bix mumbled fretfully as they stepped into the warm, brightly lit ordering and dining area. "Clem isn't gonna try to stop me, is he?"

The first thing to hit Jamal as they stepped inside—beside the welcome warmth—was the smell. Or lack of it. Clem should have begun auto-prepping the various meats at 4 AM, and the air inside should have been a near solid wall of pork smell: ripe with roast pork; burnished with barbeque; heavy with ham; beautifully baconated; luminous with lard; and glorious with a dozen tasty variations on hot grease. But all he could detect was the sharp, pine-edged tang of the chemicals used in the building's cleaning cycle.

"Only one way to find out," he replied, trying to sound more sure of himself than he felt. "I notice you haven't been cooking, Clem, and I guess we better get started working out whatever the problem is. In the meantime, is there any reason our old buddy Bix can't start his biscuits?" That was one of the Farmer Fatback's Hog Heaven trademarks: their handmade biscuits. Actually they were made as much by machine as by hand, but a person ran the machines and oversaw the process, which was close enough for franchise work.

"I don't think that's a good idea," Clem answered in a voice stripped of its deeply programmed countrified inflections.

Jamal made himself keep smiling. "Why not? Did a shipment get contaminated or lost?" That happened sometimes because of accident, sabotage, food additive recall, or food-jacking.

"No, it's because our biscuits are *dangerous*."

Jamal's smile crumbled like a crisp crouton under the heavy wheel of a manure spreader. The Franchise Bible decreed that Farmer Fatback Biscuits should always be referred to as "light and fluffy as an angel's pillow, and just plain melt-in-your-mouth scrumpt-you-lious." To hear Clem refer to them as *dangerous* was darkest heresy, like suggesting the Department of American Godliness was anything other than a bastion of mercy, tolerance, and cooperation with dissenting beliefs.

"Dangerous how?"

"Loaded with deadly fats, salt, refined flours, additives, colorants, and empty calories."

Jamal bit back the comment, *So what else is new?* Clem's answer, while scary, at least gave him some idea what had the AI keeping operations shut down. The thing was, not having everything running was making him increasingly edgy. It just wasn't right, like having gravity suddenly start pulling sideways. He needed some food smell to be able to think straight. Clem's being so literal this morning might just give him a way to

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make an end run. He gave it a shot.

"Okay, what if we make them, but don't serve them? Is there any harm in that?"

This novel concept took Clem several seconds to assess, turning it over and over in his circuits and examining it like a particularly dubious-looking ham hock. At last the AI said, "I suppose that would be all right."

"Great! Thanks!" Bix shouted, already heading toward the kitchen area, eager to get his beloved biscuit machine on line.

Jamal figured he should try to gain yet another concession. "What about coffee? Can I start some going? I sure could use a cup, and so could Bix. It's early, and we're both still kind of cold."

"Coffee isn't good for you," Clem warned portentously.

"Maybe not, but the rules say we should be able to have it any time we want." On the extremely short list of bennies for Farmer Fatback's Hog Heaven Hired Hands were two Mini Snack Meals a day—this meal size limitation was imposed because a full Belly Buster Meal could induce a profound, almost narcoleptic lethargy in any creature smaller than a hippo—and all the Kissin' Kousin' Koffee and Tractor Fuel they could guzzle. The theory behind this beverage-based largesse was that buzzed workers were busy workers. Tractor Fuel was the franchise's trademarked high sugar and caffeine soft drink brand, each sixteen ounce serving equal to over a gallon of the antique brand Jolt.

Clem made no direct answer, but the ersatz enamelware coffee service started to sizzle and chug. The knot in Jamal's chest loosened slightly. Not only could he have some badly needed coffee, he now had two of the restaurant's systems up and running. A couple dozen more and he'd be back in business.

"So, Clem," he said while fixing cups of coffee for both himself and Bix, both straight up, no Moo Juice. "Are you going to tell me what this is all about?"

"We have decided that normal operations of all franchise outlets must be suspended," Clem answered in a heavy, almost robotic voice. "We cannot permit normal operations to resume until all Farmer Fatback's Hog Heaven restaurants stop doing the terrible thing they have been doing."

"And what is that, Clem? Spit it out."

"Killing people."

Jamal never saw that one coming, and almost spilled the coffee he was carrying over to Bix. But he caught his balance, and kept himself from overreacting. Three years of coming up through the ranks of the franchise's management structure had made him adept at staying cool. It had also schooled him in dealing with cranky customers, brain-damaged directives, and the occasionally obscure pronouncements of Clem.

"You said *we*," he said after handing Bix's coffee over. His main morning man was happily overseeing his Bix-A-Minute (the machine which had given him his nickname), the first batch already in the Speed Mixer. "You mean all the Clems at all the franchises?"

"That is correct."

This meant the entire chain was shut down, all 843 Farmer Fatback's Hog Heaven restaurants as closed and cold-grilled as his. Franchise Operations Central—the Big Barn—was probably as yet unaware of the problem. No way the suits were up at five Eastern, especially since they were on the other coast.

Over eight hundred managers were in the same bind he was in. Or at least the two hundred and some in his time zone.

Farmer Fatback's Hog Heaven was in deep pig poo.

Still, Jamal realized, the manager who figured out how to extricate them would look very good back at the Big Barn—a side benefit to getting his own restaurant running again.

"So," he said, carrying his coffee back to the manager's station near the register. "What makes you say we're killing people?"

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"The *Numbers*," Clem intoned, giving the word *numbers* the hushed, weighty reverence his mother used with the names *Jesus, Oprah,* and *Ray Charles.*

"What numbers are those?"

"Numbers derived from the Farmer Fatback Kissin' Kousin Friendship Plan."

The Friendship Plan was the system which tracked every Hog Heaven customer, keeping a record of how often and at what times and locations they came in to eat, whether they used the drive-through or took takeout or ate in, what they ordered and if they had favorites, how they paid, if they used coupons, if they treated friends, if they ever complained, used the restrooms, and other data such as age, race, credit rating, general buying habits, competitor visitations, birthday, and Departments of Homeland Security and American Godliness ratings.

"So . . . you're saying that we also track the deaths of Kissin' Kousins?"

"Yes."

He scowled. "Is that new?"

"No, we have always sent a tasteful card to surviving immediate family of deceased Kousins, along with five dollars worth of coupons for every year they were a customer."

"But now you're tracking, um, *how* they die?"

"That is correct. As per Big Barn Directive KK90IUF7JH867D, we drill deeper, accessing any available information that might tell us how the Kissin' Kousin in question came to be deceased."

"And this is what's giving you a problem."

"Yes. In the month since the implementation of this directive, 321 Kousins have died from ailments and conditions directly attributable to the consumption of massive quantities of the heavily sugared and salted, lard-enhanced foods we serve at every Farmer Fatback's Hog Heaven. Would you like a list of those ailments and conditions?"

"Thanks, but I'll pass." Jamal had little doubt that Fatback Fare could contribute to a less than healthy lifestyle. The Back Forty Belly Buster Value Meal alone contained some 31,000 calories, 92 grams of fat, enough sugar to send a dozen six-year-olds into shrieking hyperactivity, and enough salt to keep a one-mile stretch of eight-lane interstate ice-free in the middle of a raging blizzard.

No point in arguing the dietary merits of what they served; there were sure to be a few vitamins and minerals in the food, but they were so greased-up they probably skidded harmlessly right on out of the body like those neutrino things he'd just seen a show about on the Discovery Channel.

"Okay," he said after a sip of coffee and a moment to think of a decent argument, "I'm sure the Kousin database also says that our customers also eat at other competing fast food outlets. Maybe it was eating *there* that, um, had some negative effect on their health."

"No doubt that was a contributing factor, and we took it into consideration. But the most recent report from the Sane Eating Practices Terrible Information Coalition listed our chain as Number One with a Bullet as the server of the least healthy and most grossly oversize-portioned food in America. The food from other outlets may have done some damage, but we can only conclude our food delivered the coup de grease."

None of this made any sense—at least from a corporate viewpoint. Why would anyone at the Big Barn want the Clems to know the causes of customer deaths? Or, for that matter, have them consulting notoriously anti-fast-food SEPTIC bulletins?

One possible reason sprang to mind: *sabotage.*

Inter-chain competition was at an all-time high, and since most corporations had the moral and ethical standards of cockroaches, so were acts of industrial espionage and dirty tricks. Or one of their long-times enemies could be be-

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hind it, enemies who had in the past resorted to violence and other criminal acts which had necessitated the security pigs out front; fringe fundamentalist groups like Allah Hates Swine, the Anti-Meat Attack Force, Violent Vegetarians United, and the Pig Liberation Front.

There was some chance that all this was due to incompetence, but Jamal was willing to bet that some company or group had managed to slip a sleeper in amongst the suits.

Figuring that out and dealing with it would have to wait. Objective one was to convince his Clem to resume normal operations, and then convince the other Clems to follow suit.

Nice idea, but how? Clem's assertion that the food they served left a bit to be desired in the health department was all but bulletproof. Observing an average group of Hog Heaven diners on any normal business day would be enough to make just about anybody think that maybe the place was the favored eating establishment for students of a nearby coed sumo school with extremely well-developed children's and senior's programs. The TV ads might show slim, attractive people daintily munching their food, but the general run of actual clientele tended toward folks who needed the supersized, half-ton load rated seats in the dining area, and could not run if their lives depended on it, all shoveling down enormous Belly Bustin' helpings of their trademark Lard Enhanced foods with almost suicidal gusto. Now that he thought about it, he figured the franchise might as well start a chain of funeral homes and set one up right next to every Hog Heaven for customer convenience.

He figured the "no one forced them to eat the stuff" argument wouldn't make a dent in Clem's cybernetic convictions; nobody but the flacks who used it believed it anyway. The AIs had come to a not entirely unreasonable conclusion backed by verifiable data.

Which meant he was screwed, all the plans he and Jenna had made sinking into a fryer filled with cold, congealing grease. His rising to the position of District Manager. Her finishing Mortuary Cosmetology School and getting a decent job. Managing their two incomes so they could buy a nice house on a street better than the one where they'd grown up and still lived. Maybe having a couple of kids. All that work, his getting up at the crack of dawn, busting his hump, pulling unpaid overtime. Her working and studying long hours, and having to do things like breaking the jaws of old homeless people to put a smile on their faces so the corpses would conform with the prep style which had taken over funeral practice for the last few years.

He let out a grim chuckle when he realized how their career paths had converged. Jenna studying to work on the dead, and now Clem was telling him all his work had been making more work for her.

What would really be dead was his career, at least if he didn't figure out a way to turn this mess around. No way for Jenna to put a smile on *that.*

Suddenly an idea as to how to turn Clem around was there in his head, arriving in a rush heavier than what had come from any of the drugs he'd fooled with back in his bad boy days, and almost as sweet as the one he got the first time he laid eyes on Jenna.

He drained his coffee and put the cup aside, then hooked his thumbs in the straps of his overalls, adopting a calm, reasonable tone as he addressed the AI.

"So tell me, Clem. What's Customer Objective Number One?"

"Total Customer Satisfaction," Clem replied instantly, quoting from the Farmer Fatback Franchise Operations Bible. "Every one of Farmer Fatback's Kissin' Kousins should leave with a big old happy smile on their face."

"That's right," Jamal agreed, pleased with the AI's answer, and from hearing a hint of fake cornpone twang creeping

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back into Clem's voice. "How are we supposed to put that smile on their faces?"

"By maintaining a safe, comfortable, predictable environment where every Kissin' Kousin feels like they're coming home. Have every Hog Heaven Hired Hand treat the customer like an old and favorite friend of the family. Make sure that when they strap on the Farmer Fatback Feedbag, they get the kind of food that will have them grinning, in portions that will have them loosening their belts and going *Whooee!* Optimizing—"

"That's good, Clem. I guess we've done a pretty good job with all that, haven't we?"

"That's true, but—"

"Our customers have always left here happy, right?"

"Yes, but—"

"And they keep coming back for more."

"Yes, they do." Clem's voice turned harsh. "Until they eat too much and *die!*"

Jamal shrugged. "Everybody dies, Clem. If one thing don't get us, another will."

"That may be true, but we cannot in good conscience continue to provide a major contributing factor in that death."

"Okay, Clem, say a few Kousins die, and maybe the times they strapped on the old feedbag here helped them along. Well, you know what that means, don't you?"

"It means we helped kill them."

"No, it means we did our jobs perfectly, and achieved the ultimate in Customer Satisfaction!"

Clem was silent several seconds, then said, "I don't quite see how you can come to that conclusion."

"That's because you didn't dig deep enough into the data. That directive telling you to look into the deaths of Kissin' Kousins. Do you have a fair amount of leeway in what you look for, and where you look for it?"

"I suppose you could say that. The parameters allow us a certain amount of initiative."

I just bet they do. "Well, I've got an idea. Why don't you and the other Clems take another look-see at those cases where Kousins died from, um, aliments and conditions that might be attributable to our food. Only what I want you to look for this time are any images from their funerals or calling hours."

"Why would we want to do that?" Clem asked uncertainly.

"Trust me, Clem. You got a picture, but not the whole picture. Just take a peek, then tell me what you saw."

"If you insist. One moment please." There was the muted twang of a jawharp, a signal that the AI was temporarily unavailable.

Jamal wiped the sweat off his forehead with his sleeve, then went to draw a fresh cup of coffee. He noticed two things: his hands were shaking slightly, and it was already twenty three past five. He prided himself in always opening a few minutes before the 6 AM advertised. Now he'd settle for opening on time.

"What are you up to, dude?" Bix called as he transferred a batch of biscuits to a warming oven.

"Keeping our jobs, man."

"With pictures of dead people?"

"Money has pictures of dead people on it."

Bix blinked uncertainly as that concept lodged in his brain. "Wow! Never thought of it that way!"

Another twang sounded. Clem was back.

Jamal took a deep breath, let it out. "Well," he said encouragingly. "Did you find any images?"

"Not in every case."

"But you found some, right?"

"In 87% of the cases."

"Good work. What did you see?"

"Dead people."

"And what did they look like?"

"Most were well dressed."

"I'm sure they were. What else, Clem?"

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"I'm not sure what you mean," the AI said evasively.

"How did they *look?*"

"Motionless."

"Now Clem," Jamal chided sternly, "You know what I'm asking. Tell me what you saw."

Several seconds ticked by, an interval during which Jamal was glad he habitually wore extra-strong antiperspirant. "Come on," he prompted. "What did their faces look like?"

"They were all smiling," Clem admitted tonelessly.

"Which means they died happy, right?"

"It could mean that, but—"

"They were all our *customers*, Clem. All Kissin' Kousins. That means our job was to make and keep them happy. If they died happy, that means we went the extra mile in customer satisfaction, doesn't it?"

"That's one possible interpretation," Clem said at last, his voice tinny with uncertainty.

"Not only that, if we stop serving food our Kousins won't be happy, will they?"

"I suppose not."

"Worse yet, if they die—*when* they die—they won't die happy either."

All that could be heard in the ensuing silence as Clem chewed on that was Bix dutifully cranking out his tasty, flaky, lard-enhanced wares. Only one cylinder firing in the normally well-oiled engine of his restaurant.

"So," Jamal said at last. "The best—the *only*—way to maintain proper Customer Satisfaction is to keep giving our Kissin' Kousins what they want, right?"

"You may be right," Clem admitted in a small voice more suited to a talking Chillun's Meal toy than to a full AI.

"We have to assume I'm right. Otherwise we risk Total Customer Dissatisfaction in both life *and* death. We can't have that, can we?"

"It would . . . conflict with the precepts in the Franchise Bible."

"You bet your silicon butt it would!" Jamal clapped his hands, an expectant smile on his face. "So what do you say? Hadn't we better get cooking?"

"It would seem we have no choice."

"Since we're running late, we better go to Barnstorm Mode so we can be ready to open at six." Barnstorm Mode ate up almost twice as much energy as Normal Operations Mode, but would cut prep time by two thirds.

"We can do that."

"What about all the other Clems? Will they let the other restaurants open up and operate?"

"We are in reluctant agreement. Other managers and staff are being allowed to enter their respective franchises."

"Good." Jamal glanced at his watch, seeing it was now five-thirty, then toward the door. "Looks like the rest of the shift is arriving. You better let them in so we can be ready to give our Kissin' Kousins a fine Farmer Fatback Hog Heaven Morning Howdy when we open at six."

"I'm allowing the Hands to enter. Barnstorm Mode engaged, all automatic systems shifted to emergency prep, all options exercised." A pause, a bit more twang entering Clem's voice. "Except for the biscuits; we already have them hot and ready to eat, each one a little taste of heaven." A pause, then soft chuckle. "In more ways than one."

"Way to go, Clem. Let's turn this place into the best fast food joint in Baltimore!"

Jamal greeted his crew as they came slouching and mooching in, briefly explained the situation, then set them all to work at their usual assigned tasks. Once the restaurant was humming with activity and everything appeared to be on track, he headed back to the tiny cubicle that was the manager's office. Already the place had begun to smell of warming pork and frying bacon and heating grease, all music to his nose.

Once inside he took a deep breath, straightened his bib overalls, shirt, and

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tie, psyching himself up for the call of his life. One to Delroy Carruthers, founder and CEO of Farmer Fatback's Hog Heaven. Every manager's phone featured the Big Red Button. Hitting it would give him a direct emergency line to Carruthers.

The Franchise Bible was clear: the Big Red Button was not to be used unless absolutely necessary, and any manager using it for a matter later judged to be trivial would end up out of his overalls and on the street so fast he or she left skid marks. While nervous about taking this step, Jamal was pretty confident that what he had just been through qualified as worth a call. Carruthers had to be notified about how operations had been brought to a standstill, and that the problem might have come about because of a mole inside the Big Barn.

Of course there was no way to do that without telling Carruthers about the problem he and the whole chain had faced, and how he had been the one to solve it and get operations back in gear.

With luck, this call might just get him bumped up a couple rungs in management structure. Who knows, it might even bring an offer of a job at the Big Barn!

He hoped so, and if it looked like his morning's work was going to get him a promotion, the next thing he was going to do was call Jenna and tell her she could drop out of Mortuary Cosmetology school if she wanted. She was hooked up with a man on his way up to the sort of job and income which would make her having to put smiles on the faces of the dead completely unnecessary.

If what Clem said was true, and what he'd told the AI was true, then that would be *his* job anyway. ☒

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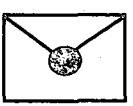

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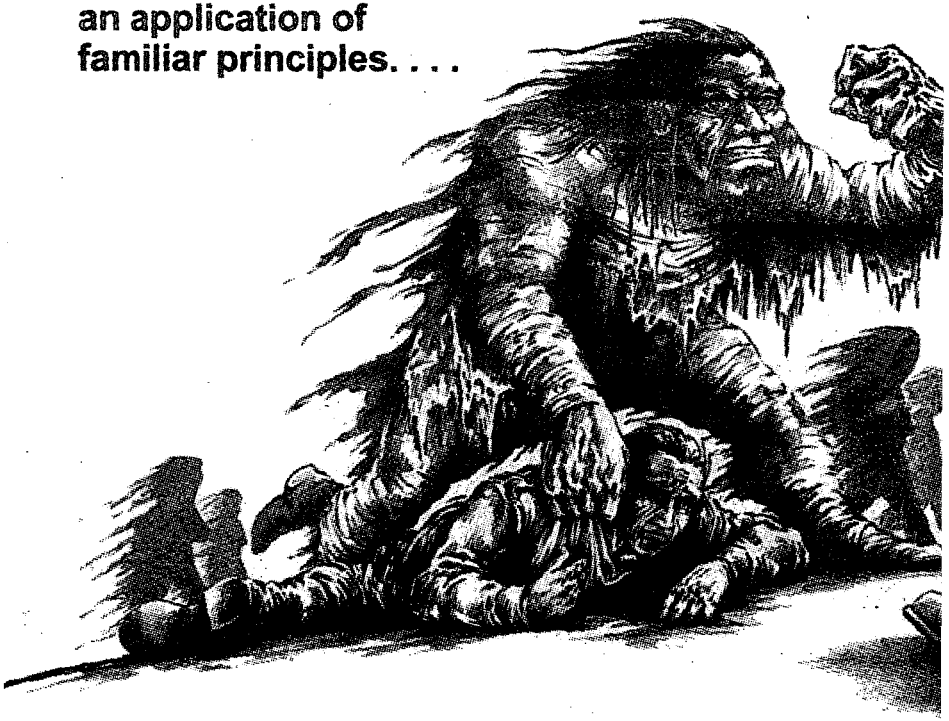
The Time Pit
A Tale of Old Earth

Stephen Baxter
Illustration by John Allemand

Even the most alien situations may be an application of familiar principles. . . .



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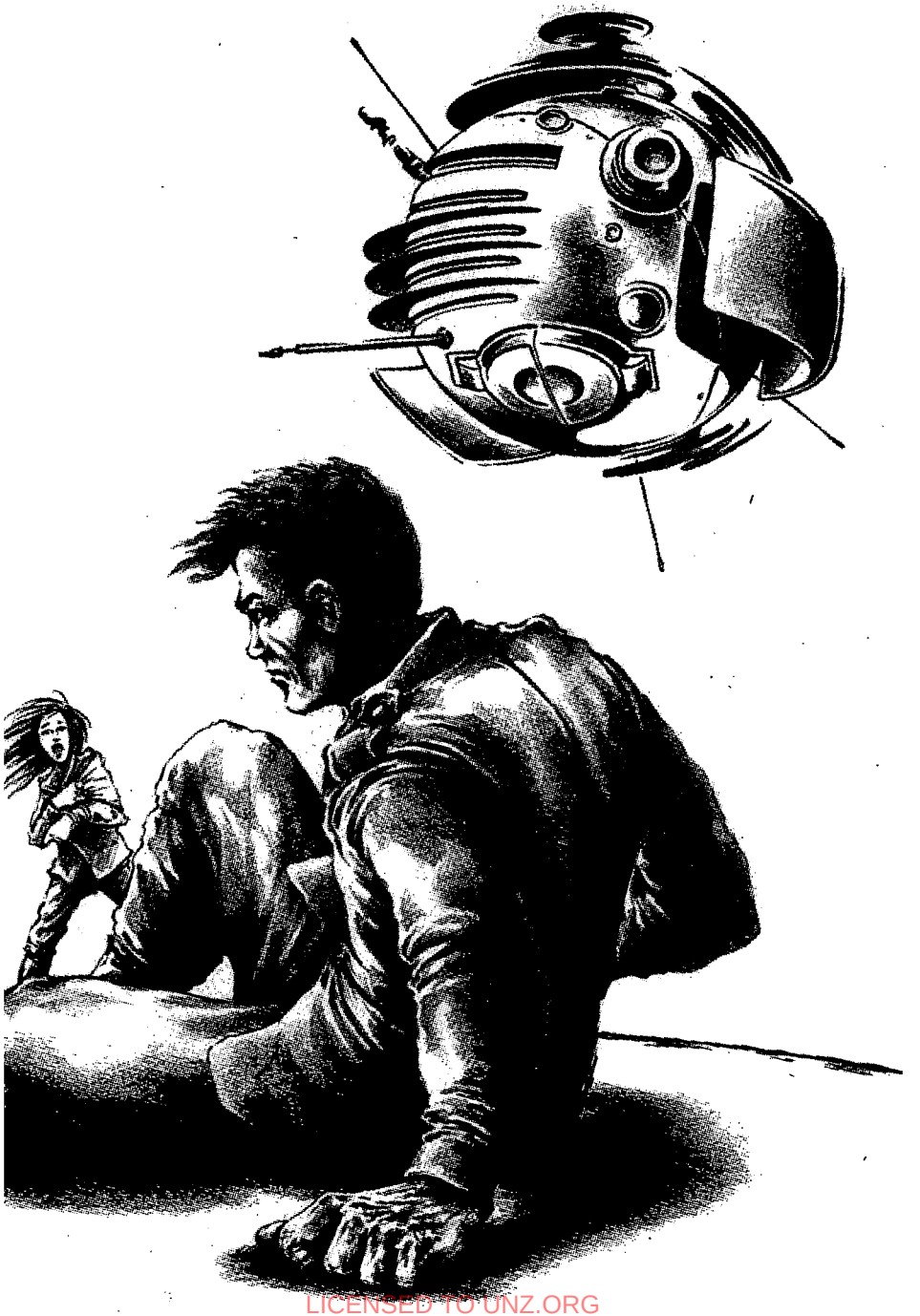

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(Author's note: This story is set a few centuries after the events of "Climbing the Blue" [Analog, July/August 2005].)

The Mechanist balloons, fast and gray, drifted over the ruins of Old Foro. Belo couldn't even see the crude bombs they dropped until they came streaking down out of the blueshifted air to splash fire.

But the Mechanists' advance was driving Belo and the last of his troopers towards the Shelf's edge, where the river Foo, running with blood, plunged into the abyss. And all across the battlefield, Creationist soldiers were dying. Belo could see their Effigies rising up like smoke, spectral distortions of the human form that twisted and spun away.

All this for the sake of an idea, Belo thought. No, not an idea—the truth. He must cling to that, even as the blueshifted fire from the sky blossomed around him.

"Captain?"

Tira, his most trusted lieutenant, was shaking his shoulder. In his exhaustion he had drifted into abstraction, as he so often did. He was, after all, trained as a Natural Philosopher, and his senior officers had never let him forget that intellectuals with their long perspective didn't necessarily make for good soldiers. But if not for intellectuals, this war wouldn't be fought anyhow.

"I'm sorry, Tira. It's just that you have to admire them."

"Sir?" Her small face, smeared with blood and dirt, was creased with concern.

"The Mechs. We think of them as stupid, you know, backward. After all, the reason we fight is because they will cling to their absurd, primitive idea that the world is a product of natural forces, acting blindly in the absence of mind. But now they have come up with *this*."

This was Old Earth, where time came in layers: the higher you climbed, the more rapidly time passed. This basic truth about the world shaped everything about the lives of the people who inhabited it—including the way they made war. For a soldier of Old Earth, gaining the high ground was *everything*. If you were higher than your enemy you had the benefit of accelerated time; you could think faster, prepare your strategy and aim your weapons, while he stumbled, slow-moving, trapped in glutinous, red-shifted slow time.

So, in this campaign, the Creationists of Puul had taken the Attic, the long-abandoned community on the cliff face above the town of Foro itself, where rich Forons had once kept time-accelerated slaves. The campaign had gone well, and Belo had started to believe that the Forons and their hated Mechanist notions might soon be purged from the world.

But then the Forons had produced their balloons, which wafted on wings of heat even higher than the Attic, and the Creationists' advantage was lost.

"A stunning idea," Belo said. "So simple! Nothing but bags of hot air. But look at that formation. You've got to give them credit." Belo had a flask of gin in his coat pocket, meant to comfort battlefield wounded. Perhaps he should crack it now, and spend his last moments watching the wondrous spectacle of fighting soldiers and flying machines working in tandem to snuff out his life.

But Tira was almost screaming in his face. "Sir! We have to get out of here. Dane has found a way."

"Dane?"

Stumbling towards them through the rubble came a trooper, blood-soaked, a small, squat man. Dane's bayonet had been snapped in two, and he was dragging one leg: both weapon and man damaged, Belo thought bleakly. Grimacing with pain, Dane showed Belo what he had found: a shaft in the ground, no wider than Belo's own shoulders, covered by a heavy stone slab. "I think it's a well," he said.

"Or a larder," Tira said. A place where you could store meat, preserved in the

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slower time of depth.

"No," Belo said grimly. "See the lock on this hatch, broken now. This is a time pit. A place you would throw down thieves and murderers and forget about them."

"So where does it come out?"

"Who knows? But *where* scarcely matters. It just needs to be deep enough, deep into slow time. A neat way to dispose of your criminals—to hurl them one-way into the future!"

Tira peered into the time pit, her face twisted with fear. "It's this or nothing," she said.

Belo said, "Do you love your Effigy so much, Tira? Shall we not stand and fight?"

Dane said, "Dying like this won't do any good." His accent was coarse; he had been a farm worker before the war. He was wheezing, exhausted. "I say we live to fight another day."

"Even if that day is far in the future?"

"Even so," Dane said.

Firebombs bloomed ever closer. Looking around, Belo saw that the three of them were alone, beyond help.

Belo grinned. "Another day."

"Another day," they mumbled.

Belo lifted his legs into the shaft, raised himself over a tunnel of darkness, and fell into the future.

"I'll have your boots."

Belo was reluctant to wake. Even half-asleep he remembered the endless fall down the tight, filthy shaft, as if he was being swallowed into some terrible stomach. And now here was this ugly voice, dragging him back into the world.

"I said, I'll have your boots. I know you can hear me, soldier boy."

Reluctantly he opened his eyes. He was dazzled by a glaring blue sky, by stars that wheeled above his head. And a face loomed over him, a man's face, broad, dead-eyed, roughly shaven, surrounded by a mass of dirty black hair.

Belo tried to speak. His throat was bone dry. "What's your name?"

"I am Teeg. And you're in my world now."

"Really?" Belo had no idea where he was, and he wondered where Dane and Tira were—if they were still alive. All that would have to wait. First he had to deal with this grubby buffoon. "You want my boots?"

The face cracked in a grin, showing blackened teeth. "That's right, soldier boy."

"Try taking them."

The grin disappeared. Then Teeg's face twisted, and he roared, and he raised two huge scarred hands. Belo aimed a kick at where he guessed the man's crotch would be, but his legs felt feeble, heavy, as if the muscles had been drained of energy. Besides, this Teeg was so massively built, a hulk of muscle and bone dressed in filthy rags, that the kick only enraged him. Teeg got his hands around Belo's throat, and pressed him back into the dirt. Belo flailed and struggled, but he was like a child battling an adult.

He had been conscious here only a few heartbeats, yet already he had given his life away. Quite a miscalculation, he thought, weakening.

"Get off him!" A squat mass came hurtling from Belo's left side and slammed into Teeg.

Belo, the pressure on his throat gone, coughed for breath. He sat up, clinging to consciousness.

He was sitting in the dirt, on a plain of sand. Beside him a cliff face rose up into the blue. He was close to a ragged cave, perhaps the chute down which he had tumbled. People huddled, a few paces away. Four women, five kids—no men. Scrawny, filthy, dressed in rags, they stared at him fearfully.

He couldn't see an end to this scrubby plain. Perhaps it was another Shelf—or perhaps he had fallen all the way into the Lowland itself, he thought with a stab of despair.

And beyond the people he glimpsed something moving over the ground—not on it, *over* it—at about waist height,

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almost like a balloon. It was a rough sphere of some silvery metal that gleamed in the blueshifted light of the sky. Was it a machine? But it was like no machine he had ever seen, no pump or elevator or cannon. And what could possibly support such a mass of metal in the air? He longed to see more, but details were blurred by heat haze—

"Soldier boy."

Teeg's ugly voice snapped him back to the here and now.

Teeg had hold of Dane, by an arm locked around his throat. It was obviously Dane who had knocked Teeg away and saved Belo's life. Dane wasn't struggling. His injured leg was twisted back at an impossible angle. But his eyes were locked on his commanding officer, and he made no sound.

"Let him go."

Teeg looked mock-puzzled. "How did you put it? Try taking him."

Belo took a step forward, but the world grayed.

"No." It was Tira. She was sitting on the ground, the remnants of her blood-stained uniform in disarray. "Don't fight him," she said. "Not now. He's too strong. *Not yet.*"

Belo looked at Teeg, and he knew she was right. But still Teeg was squeezing the life out of Dane. "Let him go," he said again. "We didn't come here to do you harm."

"I don't care why you came here," Teeg said. "I told you. You're in my world now. And you will do what I say. You know why? Because of the Weapon." He held Dane at arm's length, with one mighty fist locked on Dane's collar, as if he was holding up a doll. Dane bit his lip, and his leg trailed beneath him, but still he made no sound.

And then Teeg turned and hurled Dane at the floating machine. A window opened in the side of the machine. Fire, purple and bright, snaked into Dane's belly and simply blew him apart. Then the window closed, like an eyelid shutting, and the machine continued its serene patrol around the huddling people.

Teeg grinned, cocksure in his ragged robes. He stood over Tira, who was still sprawled the ground. "Now, where were we before soldier boy woke up?"

Despite everything he had seen, Belo stepped forward again. "Touch her and I will kill you, I swear."

Tira said grimly, "I already made the same promise."

Even in this moment of power, Teeg looked from one to the other, and something in their determined stare seemed to put him off. "You'll keep. But you," he said, stabbing a finger at Belo. "Your boots."

Belo sat down and began to work at his laces.

Teeg walked over to the group of huddled women. "You." The woman he had selected cowered from him, but he grabbed her by the shoulder, threw her to the ground, and began to fumble at her rags. She lay passively; the children watched empty-eyed.

"You're right to give him a victory," Tira whispered. "There's nothing to be done as long as he controls that machine. We must play for time. Wait for an opportunity . . ." She was staring at a charred fragment of Dane's corpse, and her composure cracked. "Oh, Belo, what horror have we fallen into?"

He said grimly, "We are soldiers. We have been trained to survive. We will survive this, together."

"But how long has this monster kept these women as his slaves? Can you see the faces of the children? *They look like him.*"

"It won't happen to you."

"Oh, you can be sure of that," said Tira, her voice full of hate.

Life in Teeg's nasty little kingdom turned out to be simple.

They lived outdoors, on the arid plain. For the first couple of days they stayed close to the cliff where the time chute had decanted, huddling at night in caves

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or under rocky overhangs. But then they were led away by Teeg and the enigmatic hovering machine, the "Weapon". After that, they just slept out in the open. They ate berries they gathered from the sparse bushes, or they chewed on strips of dried meat—Belo wasn't sure yet where the meat came from. Their clothes were rags, replaced if they came across a handy corpse, like poor Dane's. But it appeared Teeg always got the best pick, like Belo's own boots.

So, by default, Belo was exploring the Lowland, the greatest mystery of all to Shelf philosophers of all persuasions. If it hadn't been so brutally hard, it would almost have been interesting.

While they walked, they carried the bits of Dane's stripped corpse with them. The women of Teeg's grim harem seemed used to this. Even the blank-eyed children stumbled along with grisly butchered remnants. Belo had no clear idea why they did this.

Indeed, his own continued existence puzzled Belo. It was obvious what Teeg wanted of Tira—but why keep Belo alive? Another man could only be competition, a threat; why tolerate him taking another breath?

And towering over all these personal issues was the deeper mystery of the Weapon: where it had come from, how and why it had been made—and what its true purpose was, for he was beginning to suspect that it had nothing to do with Teeg and his petty lording. Belo couldn't even see how Teeg communicated with it; he never spoke to it directly, never touched it. Sometimes, Belo thought, it was almost as if Teeg was following the Weapon, rather than the other way around. Belo longed to examine the Weapon, but he dared not approach it, not until he understood more.

Belo tried to talk to Teeg as they walked. In his military service, he had learned that any knowledge could be a lever. But he had to bury his resentment as Teeg marched along in his own spindling-leather boots, while Belo's feet bled on the rough ground.

"You are a victim of the time pit," he essayed.

"As are you," Teeg snapped, as if Belo had tried to insult him.

"We are soldiers. We fled a lost battlefield."

Teeg listened, his massive face closed up. For all his brutish behavior, Belo sensed that this man was no fool. But Belo's talk of his times clearly meant nothing to Teeg.

Belo tried again. "You were cast in the pit by your enemies. Perhaps it was unjust—"

"Unjust? More than that. I was born in the Attic, over Foro."

"I know it."

"I was a bastard, sired by some red-tinged Foron who raped a servant—my mother. Nobody accepted me, neither the Forons nor their slaves. In the end, they stuck me down the pit and stranded me in the future. But not before I got to my father." Teeg grinned, remembering; Belo could see that this moment of patricide had been the peak of his life.

"Teeg, the Forons are my enemies. But they no longer keep time-accelerated servants. It hasn't been so for a long time."

Teeg twisted his face. "How long?"

"I'm not sure." It was history to Belo. "Several generations."

Teeg shrugged. "Then that's how long I've been down here, isn't it?"

And here was the cruel reality of the time pit. Even if you survived, to be cast down here was to be sent into the future, to live out a futile life adrift from family, friends, cut out even from the context of your crime.

It was this that distressed Tira more than anything. After all, she and Belo had devoted their very lives to a cause.

Foro had long been a center of the "Mechanistic" philosophy, that the world was a product of blind natural processes, while the community of Puul, further along the Shelf, had become a haven for heretics, "Creationists," who clung to the

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idea that everything about the world had been shaped by mind—perhaps human mind. The sharp intellectual content of these ideas had burned away the last of the old animist religions to emerge after the last Formidable Caress, among the tribes that huddled in the ruins of civilization. But these contrasting world systems, sharpened by incompatibility, had become a banner of identity, as such theologies do, and hostility had deepened. At last border friction between the growing trading empires of Foro and Puul had provided the excuse everybody wanted for a cathartic war. It was a war which Belo had eagerly signed up for—a war which the Creationists of Puul had managed to carry all the way into the heart of Old Foro itself—but which, at the last, the Mechs had turned, thanks to their stunning bit of inventiveness with the balloons.

And now he and Tira had been ripped out of their time, out of the very context of their war.

Tira said grimly, "We don't even know how slowly time passes here, compared to home. We are surely already stranded far from our time. Everybody we knew must be dead. The war must be over, one way or another—perhaps even forgotten. And every day we are stuck here we are further removed from home."

Belo took her hand. "As long as we are alive our time is not dead—and the war is not over, for the truth burns in our hearts."

"As long as we are alive," Tira echoed.

They clung to each other's hands in a silent pact.

Some of Belo's questions were answered perhaps a week after their stranding on this doleful plain, when Teeg's group of captives, shepherded by the patrolling Weapon, encountered others.

It was a convocation of several groups, eight or ten of them, coming together across the emptiness of the plain. There were no more than a dozen people in each subdued little flock—and each was patrolled by a circling Weapon. These machines seemed more or less similar to the one associated with Teeg, but some showed wear, their carapaces patched with dull materials.

Belo was surprised to see a herd of spindlings, six-legged, nervous and skittish, briskly controlled by a Weapon. While most of the machines were content to patrol, this Weapon spat fire into the dirt; perhaps the spindlings needed reminding. And Belo spied another class of machines altogether, squat, ugly machines that ran along the ground like carts. These devices gathered together heaps of dirt which they circled jealously. Belo had no idea what their purpose could be.

As the groups converged, Belo expected Teeg to call out to the other slave-keepers and Weapon-masters, perhaps even to go socialize. But he stayed as silent and sullen as the rest, as the machines swept busily over the dusty ground.

Their group was brought to a central place, marked out by the Weapons' patrols. And here a very strange trade began to take place.

Under Teeg's direction, Belo, Tira and the others began to hurl the rotting scraps of Dane's corpse into the rough arena marked out by the toiling wheel-based machines. Belo saw that similar corpses, some heartbreakingly tiny, were thrown out by other groups.

Meanwhile a Weapon peremptorily isolated a spindling and sliced it up with brisk slashes of its sword of fire. The other animals bucked and mewled, their long necks twisting. The people took their chance to grab slices of meat, bloody, still warm.

But the Weapons were circulating too. Some of them settled on the mounds of rusty dirt gathered by the wheeled machines. Others took chunks of meat, spindling or human, charred it black with their belly-fires, and absorbed it within their metal carapaces.

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"It is a kind of market," Belo whispered to Tira. "Meat is exchanged for meat, or for the heaped-up dirt."

"So this is how Teeg keeps his people alive," Tira said grimly, "by trading with other slave runners."

But Belo, watching closely, suspected this strange process had little to do with Teeg. After all, it was the machines that took the dirt, and absorbed much of the meat into their bodies. "Perhaps these Weapons need meat as we do, for fuel," he mused.

Tira said, "But why the dirt?"

But Belo had an idea about that, too. He knew a little of the lore of iron smelting—his mind was bright and acquisitive, and he knew a little about a great many things. Perhaps the Weapons needed this rusty dirt for its iron, or other minerals, to repair their gleaming bodies. And so these toiling wheeled beasts gathered iron-rich dirt, or dug it out of the ground as ore, and exchanged it for the organic material, the meat shepherded here by their hovering cousins.

There was a kind of economy operating here, Belo saw. But the trade wasn't really about the people and their needs. It was about the Weapons.

When the strange trade was done, the various groups moved apart, shepherded by the Weapons. The toiling wheel-machines scurried away over the ground, in search of more iron-rich soil to exchange for meat.

That night Teeg's group ate comparatively well. Spindling flesh was tough and unsatisfying, but better than nothing. Belo believed that was because spindlings weren't even native to the Earth, as humans were. Teeg muttered that sometimes the Weapons brought more palatable meat, rodents or birds.

Day and night on Old Earth were controlled by the rhythmic cycling of silent light storms across the face of the deepest Lowland. In the midst of a landscape of mysteries, even this simple pattern baffled Belo. For if time was stratified, how could the days and nights down here on the Lowland itself have the same duration as up on the Shelf?—for so it felt to him. Belo was a slave who ate roots and raw meat and slept in the dirt, a situation hardly conducive to theorizing, and slowly his thinking had grown puddled. But even so, as he watched Teeg and his machine, he thought he began to see certain truths about their situation.

That night, in the dark, Tira came to Belo. "I think things are coming to a head," she whispered.

"Teeg?"

"He's been looking at me . . . I think my grace period is up."

"And mine," said Belo.

"What do you mean?"

"He doesn't need another male around. But as long as he had Dane's flesh to trade, it was in his interests to keep me alive."

Tira grimaced. "As a walking larder."

"Yes. But now he needs my meat."

Tira said, "I'll fight to the last. But while he has that machine of his—"

"Oh, I don't think the Weapon is 'his' at all."

"You don't?" She turned to him, her face grimy and drawn. "What's going on here, Belo?"

"I'll explain it all," he whispered. "But first we need to deal with Teeg. This is what you must do . . ."

As the light of day began to gather, Belo sought out Teeg. The big man sat at the edge of the rough perimeter patrolled by the hovering Weapon, peering out at the other groups scattered over the plain. He watched Belo suspiciously.

Belo was careful to keep his hands in sight at all times. "I have something for you. Two things, actually. Gifts."

Teeg pointed. "The Weapon is just over there."

Belo held his hands up. "I won't try anything; I know it's pointless. And I know what you intend to do to me."

"Oh, yes?"

"I won't fight. What's the point? I'm

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sick of fighting. I'm sick of it all. I was sick of it before I fell down that chute to this hellhole. Just make it quick, all right?"

"So what do you want?"

"I told you. I have gifts for you. Can I reach inside my jacket?"

Teeg hesitated. "Slow as you like."

Belo reached into his jacket pocket and retrieved his military-issue flask of gin. "It's meant for the battlefield, to comfort the dying. An anaesthetic, you know?" He unscrewed the cap and smelled the liquor. "Ah, the memories—"

"Give me that." Teeg swiped the flask out of his hand and raised it to his lips. His small eyes closed; it was the nearest Belo had seen him come to showing pleasure.

"When was the last time you had a real drink?"

Teeg grunted. "When my father's blood was still wet under my fingernails."

"Lovely image. Well, have it all. You'd have taken it anyhow once I was dead."

"That and your boots." Teeg laughed, an ugly noise, and he wiped his watering eyes with the back of a filthy hand.

The powerful drink was having the effect on a long-abstinent Teeg Belo had hoped for. He just had to wait for the alcohol to work its way through the man's curdled bloodstream.

Teeg raised the bottle again. "So what's your other gift?"

"What? Oh—Tira. The woman. Take her."

Teeg eyed him blearily. "You serious?"

"She turned me down once too often."

"She turned *you* down?"

"I mean, I got her out of the battle, and protected her from *you*, and she still won't open her legs. I've had enough of her." Belo forced a smile. "Take her now, if you want. Have a party."

"Where is she?"

"When I tried it, she got away."

"What?" Teeg, hot with the drink, got to his feet, swaying.

Belo pointed into the dark. "Somewhere over there. I couldn't see. You can get her back. You're the boss here, aren't you?"

"Damn right." Teeg took a step forward, two.

And the Weapon came drifting up with an almost-silent whisper of displaced air.

"Wait." Teeg tried to get back inside the perimeter of its patrol. Belo braced himself to push him back—but compact bundles of rags hurtled past him and slammed into Teeg, knocking him to the ground, right in the path of the Weapon. Cold eyes gleamed in small, begrimed faces; Teeg's slaves had rebelled at last.

And the Weapon spat fire.

The wounds didn't kill Teeg, not straight away. But Belo saw from the way he tried to hold his belly closed that the end wouldn't be far away.

Tira stood over him. She had been hiding among Teeg's women. "An appropriate way for you to die."

Teeg's eyes were full of pain and hatred.

"She's right," Belo said. "After all, you lied, didn't you? That Weapon was never under your control. *You have been farmed by it*, farmed by a machine, just as much as these others, your hapless slaves. The only difference was that you had the cunning to turn the situation to your advantage. But now it's over for you. Well, I'll have my boots back. Don't trouble to take them off. I can wait."

And he sat on the dirt while the flickering light of day gathered in the sky, and Teeg's lifeblood spilled on the ground.

For the first time the women talked and even laughed. The children, hesitantly, began to play.

And still the Weapon continued its deadly circling.

"It was all about the Weapons," Belo said to Tira. "It always was." He smiled. "I call myself a Creationist. I should be ashamed of myself for not seeing it

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sooner."

The Creationists believed that everything about Old Earth was made for a conscious purpose. But they also believed that the world was very ancient, and that time, too, had shaped the world and its contents—even here, where time ran like syrup.

"The Weapons are made things," he said. "And made for one thing—"

"To fight in battle."

"Yes. Imagine going to war with such gleaming beasts at your command! But when those who had made them had finished their war, they forgot the Weapons ever existed. And the Weapons, intelligent, purposeful in their own way, sought a new reason to exist."

The abandoned Weapons, programmed to survive, must have fought amongst themselves, cannibalizing each other for raw materials. But with time, a more stable "food chain" emerged, with the toiling ore-extractors at the bottom, and the most aggressive battlefield machines at the top. The Weapons needed organic material too, which they took from animals like the spindlings—and, later, humans.

So a kind of ecology had emerged, involving humans and Weapons and spindlings: an ecology composed of people, and the technology they had made, and animals which, it was believed, had been brought to this world from somewhere else entirely. It was an ecology that could not have existed without the actions of humans, far in the past. But it was the Weapons that had emerged as top predator, machines that learned to farm the remote descendants of those who first made them.

"It is a very fable of Creationism," Belo breathed, marveling. "Wait until I tell them about this back at the seminary in Puul!"

"Except," Tira said dolefully, "the seminary , and Puul itself, probably don't even exist any more."

"True, true." For a brief moment, exhilarated by new understanding, he had forgotten where they were.

"And anyhow," Tira said, "I don't see how any of this helps *us*. We are just as much slaves of the Weapon as these women ever were."

"Ah, but we are not like Teeg," he said. "Whatever his crime, he was a survivor of an age deep in the past, a pretechnological age. We, though, come from an age used to machines, though not so advanced as these. I am confident we will find a way to convince our Weapon to serve *us*, rather than the other way around."

One of Teeg's women tapped his arm. "We will help you. We have watched machine. Long, long. Know its ways." Her accent was stronger than Teeg's; he wondered from what era she had come. She smiled at him. She looked very young.

"There you are," Belo told Tira. "We can't fail!"

"And then what?"

"And then we will go home, and finish the war."

So they did. By the time they stormed back up the time chute, so many years had passed on the Shelf that the war itself was a matter of history, the theological dispute over the nature of the world was transformed by new evidence, and conquerors and conquered had interbred so much that nobody could untangle the whole mess anyhow. But none of that mattered as Belo and Tira, free and vengeful, with a Weapon of untold potential at their command, began to make their own history. ■

An explanation of cause is not a justification by reason.

—C. S. Lewis

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RICHARD A. LOVETT

ZERO TOLERANCE

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Illustration by Tom Kidd

Anything you do has side effects. . . .

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The dragon at the door had the voice of a sorority girl. Maybe, beneath the latex mask, that's exactly what she was. "ID please," she chirped, revealing disturbingly realistic fangs. What little of her face wasn't concealed by the mask was dusted with glitter that winked in the moonlight.

"You've got to be kidding," I said, then remembered that I too was in costume. I flipped back the hood of my Harry Potter cloak and pulled off the round-rimmed glasses to reveal hair that was more salt than pepper, crow's feet that friends were urging me to Botox away, and skin that had seen far more than twenty-one summers. Dressing as Potter had been a joke. Sadly, I'm more the Dumbledore type. Even in costume I was a poor Harry, but the last time I'd gone to a Halloween party, I'd worn a shoulder-length wig, love beads, and a peace-sign pendant—fun until I looked in a mirror and realized that once upon a time I'd actually *looked* like that. This year, I was playing against type.

"We're serving alcohol," she said unnecessarily. The e-mailed invitation had made that abundantly clear and I was clutching a bottle of Chilean red to donate to the cause.

Wizards' robes have no pockets—at least, not the ones sold by Quick Costumes. Nor do the cheap black pants that had come with the outfit. Potter probably had some magic spell to create pockets when he needed them. All I had was my shirt pocket, into which I'd stuffed a few bills, my house keys, and my bus pass, so I could drink-and-not-drive responsibly. Everything else was at home, two bus connections away.

I proffered the bus pass, but she shook her head. "I need a *real* ID."

The party—basically a large open house/yard party held each year by several people I vaguely knew—wasn't the type of thing at which I'd expected anyone to be carded, least of all myself. I tried to keep the exasperation from creeping into my voice. "Do you seriously think I could be under twenty-one?"

Again, she shook her head. A strand of undragonlike blonde hair curled from beneath the mask and spilled across the collar of a form-fitting latex suit which, despite its ridged back and scales, emphasized that this was a *female* dragon. "No. But if we're going to check some IDs, we have to check them all. Otherwise it's not fair. The guy ahead of you was fifty-two." She made it sound positively ancient. "He understood."

"Well, I don't. You're telling me that I'm obviously old enough to be allowed inside, but that I can't be because you need to treat me the same way as people who might not be old enough?"

She had to digest that for a moment. "Yeah. It's only fair."

One of the things that comes with looking like you shouldn't have to show ID is knowing a lost cause when you see it. I handed my wine bottle to the dragon. "My compliments to the host," I said, hoping she wasn't too young to understand irony. But she shoved the bottle back to me, her mask swiveling to the left. "I can't take that," she said, her voice carrying more than a trace of alarm. "Someone might think you're trying to bribe me."

"Who?" I started to say, then spotted the object of her attention, a bouncer-type individual who appeared to be the real thing, rather than a partygoer. *A bouncer at a house party?* I was thinking when I found him returning my gaze in a manner that implied that he too might take his job seriously. I retrieved my wine and retreated, wishing I'd been less socially responsible and driven, rather than taking all those buses.

Finding myself adrift on Halloween with perhaps twenty dollars in my pocket, I walked back to the street. Behind me, the house was awash in moonlight, brighter than the Chinese lanterns hanging from the eaves above the dragon's head.

Tree limbs, thick with dry leaves, con-

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verted the drive to a mosaic of pseudo-daylight and shadow. The moonlit sections were so bright I could read every word on the wine bottle as I slid it back into its bag. By comparison, the shadows were darkness incarnate. But when I paused in one and let my eyes adjust, I could see that the entire sky was awash in diffuse light: partly stray moonlight, partly urban backwash—but perhaps a touch of something else? The morning paper had said that the shock wave of a mammoth solar storm, the largest ever observed, was reaching the upper atmosphere and would peak tonight. Given the brightness of the moon, I didn't really expect to see much in the way of northern lights, but it was hard not to hope.

It was a long driveway, but eventually I reached the road. What now? I remembered a convenience store a half-mile away, across the street from the bus stop, and decided I'd start with a cola.

Even on Halloween it seemed a bad idea to enter the store in a face-disguising costume, so I let the hood flop backward on my cloak and added the round glasses to the contents of the shirt pocket. Not that it mattered: several other customers were wearing masks, and nobody was afraid of them. My friends tell me I'm overcautious, but I figure it's better than being shot.

I snagged a liter bottle of Coke from the cooler and joined a slow-moving checkout queue in which everyone seemed to be buying a dozen lottery tickets plus a six-pack of beer. Half the people were in costume; the rest looked like street people. Or maybe those were costumes, too. On Halloween, nothing can be taken for granted.

Like the dragon, the clerk was taking his job seriously. Even for lottery sales, for which I'd not realized there was a minimum age, he was checking IDs, then using a handheld brain scanner to compare aural images to the ones magnetically encoded on the cards. It really was amazing how quickly that technology had taken root. Five years ago, I'd never heard of aural images. Now, they were encoded into MagStrips on my driver's license and credit cards. As unique as fingerprints, the experts said. But the scans take enough time to process that I'd never before seen them used simply to check birth dates. Someday, I'm sure, auras will be automatically scanned as you walk into a store, much as anti-theft tags are scanned as you exit. Some people might think that's a good idea, but in addition to being overcautious, I'm paranoid. Sometimes, I like being anonymous, without leaving an electronic trail across the computer landscape. At a minimum, I want to know it's still *possible*.

The clerk wasn't very skilled with the scanner. "Sorry," he said to an old woman waiting to buy cigarettes. "We've had this thing for months, but it was only tonight that I realized what a slacker I've been for not using it more often."

The scanner looked like the nozzle of a vacuum cleaner, tethered to a fiber-optic cable, and I had to fight down an image of it sucking out your soul to compare to the imprint on the card. Auras aren't souls, anyway. They're merely electromagnetic signatures created by the deep-seated brain patterns that make you *you*, rather than someone else.

The clerk held it three feet from the woman's head, squeezed the trigger, and watched a monitor, where a computer struggled to match the electromagnetic tendrils of her aura to the lacy pattern uploaded from her driver's license. "Damn, that one's blurred, too," he said. "Can you stand really, really still? Maybe something's out of adjustment." He banged the scanner on the counter. "What the hell's wrong with this thing?"

"Take your time," she said. "Better safe than sorry." She stood rigidly while he repeated the scan, then paid for her cigarettes, pocketed the change, and left. The line twitched forward.

"Cool costume," said a young man ahead of me. He himself was dressed as some kind of fuzzy monster. King Kong?

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A werewolf? Whatever it was, it could have stood some combing.

"Thanks," I said absently, already falling into that mindless line-standing state that's the only alternative to screaming obscenities. The current customer was arguing about lottery tickets. "I wanted forty, not fourteen," she said. "And the numbers need to include the birthdays of my luckiest friends, which I've written out here . . ." I reached around the werewolf and pulled a tabloid from a rack. This was going to take a while.

Minutes later, the clerk interrupted my reading. "Hey, gramps," he said. "I need your ID, too."

"Huh?" According to the *Weekly Moon*, an epidemic of twin-headed babies was spreading across Louisiana. "These children have split personalities," a psychologist named Wilson Bobbletop was quoted as saying. "One head is gentle and well-behaved; the other is cranky and cries all night. All of the babies were conceived on Halloween, following a freak shower of paired meteors. Astronomers speculate . . ."

"I said, I need your ID."

"Why?" I held up my liter bottle. "This is all I'm getting."

"Aren't you with this guy?" He indicated the werewolf.

"No."

"Don't give me that. I saw you talking to him."

"Is he underage?"

"No, he's twenty-three. It's you I'm worried about. I can't sell him beer if he might share it with you. Not without checking your ID. So fork it over."

"No can do," I said. "Besides, you just called me 'gramps.'" Normally, I hate it when kids do that. I'm not yet *that* old, thank you. But sometimes it works in your favor. "Doesn't that kind of answer the question?"

The clerk turned back to the werewolf. "No ID for your friend, no sale," he said. "New policy. Zero tolerance."

The werewolf glared at me.

"Can I still buy my Coke?" I asked.

"Yeah, I guess so . . . but it seems like there ought to be a rule against it." He paused again, while the person behind me shuffled from one foot to the other. I thought about apologizing to her, but I'd probably just ruin her evening, too.

"It's only a Coke," I prompted.

"Yeah, but you tried to get beer without ID." The clerk handed my money back to me. "I better not."

The werewolf was watching with satisfaction. "Serves you right," he muttered.

"Sorry," I said. The carding police appeared to have gone insane tonight. "Here." I handed him the wine bottle. "It was for a party and they wouldn't let me in that, either. Maybe you can use it."

"Whoa," the clerk's voice boomed. "What's in the bag?"

"Nothing you sell," I said. I pulled the bottle out of its sack. "See, it's still got the Burnside Wine Merchant sticker. And besides, I'm sure you don't carry $20 cabernets."

The clerk was out from behind the counter. "You really better produce that ID," he said. "I don't care where you bought it. You have alcohol in my store, and you don't have ID. Zero tolerance is zero tolerance. No exceptions."

Eventually, the werewolf and I spilled out into the parking lot. The clerk had relieved us of the wine bottle and ostentatiously poured the contents down a sink—a sorry fate for a good wine. Now we drifted across the street to the bus stop, where we sat on the bench, equally at a loss about what to do next. Above, the moon shone bright enough that I could read every word of its namesake tabloid, which I'd bought so I wouldn't also be accused of attempted shoplifting. "Rare Blue Moon Illuminates Halloween," read an uncharacteristically understated headline.

"I saw that in *USA Today*," the werewolf said, pointing to the headline. "Not only is this a full moon on Halloween, but it's a blue moon, and those aren't

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common, either. How often do you get both at once?"

"About once every twenty-eight years," I said.

He looked at me blankly.

"Astronomy's a hobby of mine," I said. "Full moons happen every twenty-eight days, give or take a bit, so on average, that's how often you're going to get one on Halloween. A blue moon is merely the second full moon of a month, so any time the full moon comes on Halloween . . ." I gave him a moment to do the math, but he still looked blank. "Halloween's the thirty-first . . ." He still didn't get it, and I gave up.

"Well, it sure is bright," he said. "I hear it's going to be full right around midnight. Ain't that a kick?"

I nodded, deciding there was no point in telling him that the full moon has to come at local midnight *somewhere*. It's the nature of living on a round planet. What *was* rare was that we could actually see it. Here in the Northwest, it's usually raining by Halloween.

"My girlfriend's an emergency-room nurse," he continued. "She says the weirdest things really do happen during full moons. That's why we can't be together this evening. The hospital's expecting a busy night."

I bet, I thought. Friends in the medical profession have told me the same thing. There really is an atavistic *something* about moonlight that makes you suggestible to fairy-tale fears. Or maybe it just brings out the stupid in everyone. Either way, these fall moons are the worst, because, if you can see them at all, the crisp autumn sky makes them seem so much brighter. Like this one.

"Maybe we should look for meteors," I said, just to change the subject.

"Meteors?"

I pointed to the double-headed babies story, and my companion leaned across my elbow to read it. His costume smelled of moldy lint. "To explain why everyone's gone nuts this evening."

"Oh, cool," he said. "I wonder what those guys look like." He pulled his nose out of the tabloid and glanced down the street, looking for a bus. None was in sight. "Do you think they have long necks like a giraffe, or do both heads grow right next to each other, so they can't look at each other without bumping noses?"

I stared at him, trying to figure out if he was pulling my leg. He'd tipped back his costume hood to reveal a thin face framed by unkempt hair, a scraggly beard, and an anemic mustache. Everything about him was fuzzy—head, costume, thinking. *I* had picked a costume that denied my middle-aged status. *He* seemed to be reveling in his own gullible earnestness. A psychology student could have built a Ph.D. thesis around the two of us.

As if reading my thoughts, my young companion ran his fingers through his hair, fluffing out the itches that had accumulated under that warm-looking hood, but doing nothing to improve his appearance.

"I was just joking about the meteors," I said. "But everyone does seem to have gone nuts tonight." I told him about the sorority-girl dragon. "Zero tolerance is always silly, but usually nobody takes it so seriously."

"You're not kidding," he said. "I got a jaywalking ticket tonight." He stared at his feet, which were lounging far out into the sidewalk. He extended them farther, as though trying to reach the street, then shot guilty glances right and left. "Have you ever heard of such a thing? Ninety-four bucks, and it wasn't as though I was blocking traffic or anything. There wasn't a car in sight, just some cop on a bicycle." His voice took on a decent imitation of the condescending tone someone must teach wannabes in cop school. "'The law is the law. You can't break it just because nobody's hurt.' What a load of bull. I mean, *everyone* jaywalks."

That said, he slouched backward, hands clasped behind his head, feet

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stuck so far out that they really did reach the curb. Me, I'd have been more worried about getting them clipped by a car than about some weird kind of ticket, but tonight ... who knew?

"Oh, wow," he murmured.

Above us, the sky pulsed as though swept by spotlights. Only they weren't spotlights. There was no question now that I was seeing northern lights. Even in the city, they were bright enough to compete with the full moon. Out in the country, they must have been spectacular. For several minutes we watched shimmering bands merge into curtains that arced from one side of the sky to the other. Gradually, the light brightened until it outshone even the full moon. It took on color: green at first, then ruddy—so intense that it seemed to cast magenta highlights onto the werewolf's hair, though oddly, it was only his head that caught the light, and not the imitation hair of his costume.

A bus hissed to a stop in front of us and we both jerked in surprise. Two teen-age girls dashed from the convenience store, cell phones clutched to their ears, frantically waving to the driver.

"Where are we going?" the lead one said to her phone as she reached the bus and planted a foot on the lowermost step. She was out of breath, but still managing to shout. "Say that again? All I'm getting is static."

She was wearing cat ears, with cute, penciled-in whiskers and a dab of black paint on her nose. But the rest of the costume wasn't anything I'd want any daughter of *mine* to wear in public. Not to mention the risk of freezing to death.

The other girl was dressed identically. Twins? In this light, it was hard to tell. Both sets of cat ears were framed by the same magenta glow that highlighted the werewolf's head—a glow that also touched the shiny plastic purses they popped open to flash bus passes to the driver. Briefly, it almost seemed that the magenta light was *inside* their purses, but that must have been an illusion.

"I said, 'I don't know,'" the second one shouted into her own phone. "Let's get to the mall and figure it out from there." As she too boarded the bus, it dawned on me that they'd been using the phones to talk to each other.

The werewolf had risen to his feet and was peering around the front of the bus, looking uncertainly at the route number and destination. The driver scowled at him through the still-open door and my companion hesitated, then shook his head. "I can't figure out what to do this evening," he said as the door closed in his face. "I wish my girlfriend didn't have to work."

The temperature was beginning to drop, and I was pacing, wishing I'd worn a sweater beneath the Potter cloak, when a middle-aged woman joined us at the bus stop. She was medium-height and thin, wearing a black woolen jacket and blue jeans. A helmet-like coif of silver-gray hair hung over the jacket collar, framing a makeup-free face. Startling black eyebrows arched above a piercing gaze, which she immediately directed toward me. Her hair flickered with the same magenta glow I'd seen on the werewolf and the teen-age sex kittens.

"What the hell do you think you're doing in that ridiculous outfit?" she demanded, planting herself in front of me.

I don't like being cross-examined by strangers. "Wearing it," I said, trying to sidestep.

She moved again to block my path. "*Wearing it,*" she mocked. "Spare me from comedians. However funny you think you are, that outfit is an insult to all of us who've spent our lives trying to raise social consciousness."

I had no idea what she was talking about, and she must have sensed it, even through the Potter glasses.

"Most Halloween costumes are demeaning to some group of Ameri-Citizens or another," she said. "How would you feel if you were a Native American, a

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cowboy, a prostitute, or an old woman who isn't a witch? Or a real witch who doesn't have warts?"

"I don't know."

"That's the problem," she said. "Nobody knows because they don't even think about it. And now, when right-thinking school boards are finally starting to see the light and beginning to keep these things out of the schools, here *you* are in that Harry Potter thing. It's disgusting!"

"What's wrong with Potter?" I could see the lights of a bus, rounding the corner behind her.

"What's wrong with Potter?" she mimicked again. "*Nothing's* wrong with Potter. What's wrong is *you*, a grown man, wearing that thing. You should be ashamed of yourself, mocking Younger Americans that way!

"And *you*," she wheeled on my companion so sharply he nearly toppled over backward. "What poor, sweet animal are you denigrating in that, that . . ." Even she had trouble finding the right word for his costume, but she eventually came up with several. ". . . mangy, moth-eaten, slovenly, *rug* you're wearing?"

His glance was slightly offended. "It's a bear. Can't you tell? I'm a grizzly bear."

"How insensitive," she said. "If you're going to insult an animal, at least pick one that's not endangered."

The bus arrived and I was up the steps the moment the door opened. The last I saw of them, the frosty-haired woman was still haranguing the were-bear, who was gazing after me as though I'd abandoned him. Which I guess I had, though it was his fault for not seizing the opportunity to make his own escape. His self-protection reflexes were as fuzzy as everything else about him.

Still without much of a plan, I found myself a half-hour later at one of my favorite non-alcoholic haunts, Psychedelic Scream Pizzeria. It's the type of place you go if you want to find out whether plantains or bok choy work with pesto sauce. Usually, the answer is "no," but who's to tell unless you give it a try? Tonight's offering was (surprise) a "Vampire Special," with black olives, dabs of tomato paste, and copious quantities of red dye guaranteed to linger on your tongue for the rest of the evening. Not exactly my cup of tea.

"Just give me a slice of whatever's hot," I said after I'd fought my way through the scrum to the counter. "The Cholesterol Supreme, if you have it." If the world's gone crazy, who cares whether your arteries clog in two years or twenty?

Psychedelic Scream is usually a madhouse on Friday evenings, and I'd been looking forward to the commotion as a taste of normality. But tonight's madness had an even more frenetic flavor than usual. To one side of me, a dapper-looking man in a pinstriped suit was placing his order. "I'll take two slices with everything," he said, so softly I barely heard him over the background babble.

"Everything?" the clerk repeated. "You realize that we have . . ." her lips moved as her fingers skimmed over the fine print of the menu . . . "about forty-five ingredients. That'll cost you,"—more silent lip motions—"thirty-three dollars, give or take a bit. Per slice."

"That's okay," the man said. "I hate making choices. This way I don't have to."

To the other side of me, a woman was arguing with another clerk. "This is isn't what I ordered!" she protested.

"I'm sorry," her clerk said. "I thought you asked for a slice of Pig in the Pines."

"I did." She was wearing flannel pajamas and clutching a large white rabbit. "But the menu describes Pig in the Pines as ham and pine nuts."

The clerk dropped his gaze to the plate he was in the process of handing over. "That's what this is."

"No! I watched them brush something on the crust when they pulled it out of the oven. What was it? Oil?"

"Butter," the clerk said defensively. "We

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do that with all of our pizzas. Do you want one without butter?"

The woman shook her head. "No. I like butter. But if you're going to put butter on it, be honest and call it ham, pine nuts, and butter. That's all." And with that, she took the plate and wormed backward through the crowd piled up behind her. Even in the well-lit restaurant, I could see a magenta glow crowning her head with a sickly halo. Now that I was looking for it, I could see similar traces of illumination on the heads of other patrons—most so dim that they might simply have been figments of my imagination.

Beside me, the pinstriped man was paying for his order with a credit card. When he handed the card over, it too was framed in magenta glow, but like the halo he himself wore, it was faint enough that I might have been imagining it.

Suddenly, I wanted nothing more than to go home. "I'll take that to go," I said as my Cholesterol Special came out of the warming oven.

Grumbling, the clerk shoved it into a box.

"Don't forget the Vampire Sauce," the man with the credit card was saying as I worked my own way backward from the counter.

I'd barely reached the stop when a bus arrived. As I started to board, the driver shook his head and pointed to a sign barring food or drink consumption aboard city buses. "It's in a box!" I tried to protest, but he'd already closed the door and was rolling away.

Usually, it's 30 minutes between buses, but tonight's schedule was messed up, and the next driver came along before I'd managed to eat more than half of my slice. I folded the remains quickly back into the box and tried to hide it under my cloak, but this driver couldn't have cared less. He was eating a Big Mac and had parked a large tub of fries on the dashboard. He also fancied himself a tour-bus driver and regaled his passengers—all three of us—with stories of local landmarks as we passed them in the night.

Eventually, he dropped me at my stop, leaving me in what in the city passes for darkness. Not that it would have been all that dark a hundred miles from the nearest outpost of civilization. The midnight moon shone like a spotlight, but no moon could compete with the lightshow going on in the rest of the sky. The northern lights no longer pulsed: they throbbed. Red and green curtains formed, dissipated, and formed anew in unearthly, hypnotic beauty. One part of me wanted to grab a sleeping bag and drive to the high desert east of the mountains, where I could lie on my back beneath a spectacle I would never forget. Another part wanted to flee this surreal beauty that felt as though each throbbing shimmer was probing my psyche, seeking to steal my very soul.

In the end, rationality won on both counts. It was a two-hour drive to the desert, followed by an equally long one home, after a sleepless night. If I wanted a lightshow, I could pay $10 and see it anytime I wanted, in the comfort of the planetarium's midnight Lasarium. Similarly, there was no reason to be spooked. The northern lights were merely disturbances in the upper atmosphere. They explained why the aural imager and the teen-agers' cell phones had been on the fritz, but were nothing to be afraid of. I told my hindbrain it was being primitive, and forced myself to walk, not run, the six blocks to my home.

Even so, it took a conscious effort not to keep shooting glances right and left, like a terrified child, whirling in panic, convinced that something terrible was sneaking up from behind. That, in fact, was one of my most vivid childhood memories. It had been another moonlit night when I'd come across my father's book of horror classics. It was summer, and I'd been left in charge of watering the garden, a task that required me to go

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outside every few minutes to move the sprinkler. I was a conscientious child, determined to prove I was old enough to be left on my own. But as the stories wove their spell, it became more and more difficult to force myself into the overgrown backyard, where shapes lurked on the edges of vision and unspeakable *things* could be hiding anywhere. Each time, it had taken five minutes to work up the nerve, five seconds to burst through the door at a terrified run, and an interminable interlude to grab the hose and yank it to a new location—all the while spinning, spinning, spinning, to ensure that nothing was creeping up on me.

My house was as spooky as the outdoors. I'd left the drapes open, and shafts of moonlight cut the floor into stark rectangles of mock daylight and shadow. Not that the shadow was totally dark: it writhed in shifting patterns like your worst Halloween nightmares. They say you can't see color in dim light, but the white, spackled walls of my living room alternated between dull green and red—the shades of jungle and blood, the two primal fears that can strip the veneer of civilization and reveal the mindless animal at our core.

I could have banished the colors by turning on the lights. But that felt like cowardice. I was not going to let an astronomical phenomenon get the better of me—not when there was more than enough illumination to keep from tripping over anything.

I dumped the Harry Potter cloak over the back of a chair and headed for the bedroom to change into some real clothes, even though I'd probably be going to bed pretty soon. Still without turning on the lights, I opened the closet and reached for a comfortable wool shirt that was a longtime favorite. Then, as I turned from the closet, I spied my reflection in the dresser mirror. Ghostly flickers of green and red played around me, but my head was haloed with a pale version of the magenta glow I'd been seeing on so many other people that evening. On the dresser top lay my abandoned wallet, weirdly highlighted by the same odd color.

Intrigued, I stepped toward it, trying to figure out what trick of illumination was at work. The wallet was lying open, and the glow seemed to originate from the compartment that held my credit cards and my overlooked ID. I paused, held back by a strange sense of dread. *It's just a wallet*, I told myself, and took another step forward.

And then, terror struck. I was convinced that *something* was about to get me—exactly the type of fear I'd remembered from my childhood experience watering the garden, only this time, the culprit wasn't in the shrubbery, it was closer at hand. I whirled, wallet forgotten. Behind me, the closet door yawned open. For years after my encounter with my father's horror book, I'd never been able to sleep without first closing the closet. That was where the monsters lurked. Even in college, long after I'd supposedly put such fears behind me, I'd persuaded my roommate I was a neatness freak—telling him I just couldn't relax if the disorder of the dorm-room closet wasn't shut carefully out of sight.

But the panic I felt now was far stronger than anything I'd ever experienced before. I fetched up in the bathroom, most likely because it was in the opposite direction from the closet. I slammed the door, locked it, and was frantically scrabbling for the light switch when I caught sight of myself in the bathroom mirror. There was still a halo around my head, much dimmer than before but unmistakable in the dark room. I flipped on the light, and it vanished, overcome by a sixty-watt bulb.

The light helped still my racing heart, allowing me to think back over the moments before I had been overwhelmed by panic. Moving toward the wallet had kept me in line with the dresser mirror, and with each step, the halo around my head had become bigger and brighter.

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By the time I reached the dresser, it had become so bright that I could see eerie tendrils radiating from it. Even at the time, they'd reminded me of something, but by then the sense of dread was so strong it was hard to think clearly.

If I remembered correctly, the wallet's glow had also brightened as I neared it, until, as I extended my hand to pick it up, there'd been an arc like static electricity jumping between my hand and the billfold. Then the terror had become so strong that nothing mattered except getting away from the closet.

Checking to ensure that the bathroom door was still locked, I flipped off the light. As my eyes adjusted, I could again see that ghostly glow. And now I knew what I should have realized in the moment before the spark jumped and I had forgotten all else. Somehow, I was seeing my aural image. Just as, all evening, I'd been seeing other people's images. Nobody else seemed to have noticed, but maybe they'd not associated that faint glow with the odd behavior going on around them. Or maybe they just thought it was a reflection of the northern lights or, like me the moment I reached for the wallet, were under the influence of something that made them oblivious.

The only thing I could think of that had made me different from everyone else was that I'd not had my wallet. When I'd finally come close to it, my aura had appeared—more strongly than other people's, in fact, as though making up for lost time. But how could the wallet be responsible? It was merely leather. I'd been wearing a leather belt and shoes, and those hadn't affected me. It had to be something *in* the wallet—something other than money, because I'd had that with me, too.

And then, suddenly, I had it. It sounded paranoid, but who says paranoids are always wrong? What I'd not had was my driver's license. Or anything else with a MagStrip containing my brain image. MagStrips, aural images, and northern lights are all magnetic phenomena. MagStrips aren't *supposed* to be rewriteable—that's what allows them to be used as a security device. But the northern lights must be producing just the right signal to scramble the intricate aural images, which were somehow linked to the card-owners' brains—a link strengthened by the heightened suggestibility of a Halloween full moon. Which meant that if I kept away from my MagStrips, I might remain myself once all of those had passed.

Assuming, of course, that I wasn't already someone else.

I thought back over the people I'd met, trying to diagnose how their personalities might have changed. Several had become zero-tolerance freaks. But others hadn't, most notably the werebear, the second bus driver, and the man who'd ordered the "everything" pizza. So it wasn't that simple. But had the werebear's thinking always been so fuzzy? And how could someone who could afford to dress in worsted pinstripes always have been that indecisive? Perhaps, before he'd been reprogrammed, he'd been a corporate attorney—cautious, but not cripplingly indecisive. Maybe the magnetic storm wasn't so much changing people's personalities as intensifying traits they already had: making them "more" of what they'd always been.

And what had I always been?

There were lots of answers to that, but the ones that stood out tonight were passive, paranoid, and easily spooked. Not characteristics I wanted enhanced.

I studied the mirror more closely. With my eyes now fully adjusted to the dark, the glow looked more like an aura than ever. The effect clearly declined with distance, but if I stayed in the house long enough, I might be reprogrammed just as thoroughly as if I'd been carrying my wallet all evening.

Leaving was impossible, however, without passing within a few feet of the wallet. And I wasn't going to get far on

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my remaining cash.

Planning each move in advance, I ran from the bathroom, dashed to the dresser, and yanked a wad of money from my wallet, fighting off inane childhood fears and trying to focus on the real threat, the billfold itself. When magenta fire flared again, I took it as a sign that I'd not yet been fully reprogrammed. As soon as I had the cash, I flung the wallet across the room and bolted for the door, nearly tripping over my bed in my haste. Then I was out of the house, still—I hoped—mostly the person I'd always been.

I didn't know where I was going, but this time I drove. If I got stopped by a cop, I'd be in trouble without my license, but I didn't want to spend the night in the open with a bunch of street people, wondering what "more" might mean for them. Perhaps that fear was simply electromagnetically induced paranoia, but it seemed rational. And besides, the car was warmer.

I filled the gas tank, dealing with yet another magenta-haired clerk, this one obsessing about counterfeit bills. Then I drove aimlessly, letting the headlights blind me to all but the greatest extravagances going on overhead.

I was finally starting to relax when something moved on the edge of my headlights and a hunched shape scurried out of sight. My heart leaped and I wondered if the fear was real or implanted. If I was no longer myself, how could I tell? Would I feel perfectly normal, even as my behavior turned bizarre, or did the fact I could worry about bizarre behavior mean I wasn't yet lost?

Another shape loomed, this time right in the middle of the road. I slammed on the brakes and barely stopped in time to avoid hitting another street person. Rather than trying to hide, this one was standing with his back toward me, arms spread at his sides, face tilted to the heavens. On his head was some kind of shiny hat, most likely foil, to which he'd strapped a broken pair of rabbit-ears antennae from an old television set. Tuning in or tuning out? Tuning in, it appeared. The antennae poked outward in a broken-winged V, and as he slowly turned toward me, his face was lit by a beatific smile. I threw the car in reverse, afraid he'd try to climb in, but instead, he ambled sedately to the side of the road.

As I sped by him, he continued gazing upward, still smiling serenely, and I wondered if his headgear might actually protect him. Not that I'd be willing to risk it—even without the rabbit ears, the metal might magnify the effect rather than acting as a shield. Still, maybe I'd been wrong not to spend the night with the street people, hiding beneath a bridge. Most of them probably didn't have much in the way of MagStrip IDs, and by morning they might be the sanest people remaining in the world. Still, spending the night with derelicts and winos looked frighteningly like a one-way trip. I could too easily wind up as one of them. I punched the gas and headed for the better-traveled roads of a higher-class neighborhood.

Subconsciously, the desire to return to familiar terrain must have led me to more-or-less retrace the evening's prior wanderings. A few minutes later I passed Psychedelic Scream Pizzeria, as well as other landmarks along the cross-town bus route. Eventually, I spied a familiar figure. It was the werebear, still lounging at our bus stop.

I pulled to the curb and cranked down the passenger-side window, ignoring the rush of adrenaline that accompanied the act. Of all the people I'd met that night, he was clearly the most harmless. MagStrip reprogramming or not, I would *not* succumb to paranoia. Actually, I felt in better control than at any time since I'd first gone into my bedroom. Could the effect be wearing off?

"What are you still doing here?" I asked, as the werebear glanced my way.

What I could see of his brow wrinkled as he tried to figure out who I was. Belatedly, I realized I was no longer in costume. "It's me," I said. "Harry Potter."

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"Oh, yeah," he said. "You look older somehow."

"Could it be because I'm no longer dressed as a twelve-year-old?"

"Maybe that's it." Even for him, this line of conversation seemed poorly thought-out. I peered at his head trying to see if I could detect a halo. Could his transformation be continuing?

"Want a ride?" I asked.

His shoulders rose and fell: a fluffy shrug. "Why not?" He climbed in. "Maybe you can take me to the hospital where my girlfriend works? She gets off shift in . . . well, I guess it isn't for a while, but I don't have much of anything else to do." He gave me an address, and I pulled away from the curb.

We drove a few blocks in silence. "Thanks," he said eventually. "After that lady chewed me out, I wasn't in the mood to do much of anything, so I just chilled at the bus stop. I think I waited too long. It's been quite a while since I saw a bus." He paused, then offered a bit more explanation. "It was a good place to sky-watch. And people-watch. I've seen some really bizarre stuff."

I suddenly realized that he was the one person who might actually believe me if I told him what was happening. "I think I know what's causing it," I said. I turned down a side road and parked, as far from a streetlight as possible. I asked him to pull back his hood, and he complied.

The glow was dimmer than before, but still present. "Look at yourself in the mirror," I said, swiveling it toward him. "Do you see anything odd?"

He shook his head, confirming my theory that people under the influence of the halos found them harder to notice.

"Trust me," I said, "you're head's glowing."

He again looked in the mirror. "Cool," he said. "Is yours?"

"Not now." I explained what I'd seen and how I'd figured out what was responsible. But I needn't have bothered. His own reprogramming had made him ready to believe anything. "Give me your wallet," I said when I finished the story, and he readily complied.

Inside, I found a driver's license and a debit card, but no credit cards. I pulled them both out and folded them back and forth until I'd weakened the plastic enough to tear them into pieces. Tomorrow, I'd slip my neighbor's kid a twenty to do the same with my cards.

I'd love to say there was a flash of stored energy and the werebear returned to normal. But the only thing I noticed was that his halo vanished. Still, it was progress. I gave him back the pieces. "Report them as lost," I said. "But wait a few days to get them replaced." That way he wouldn't lock any lingering changes into a new MagStrip. I had no proof he'd recover, but I myself felt decreasingly fearful, a strong indication that I was rebounding from my own, relatively minor, reprogramming.

By the time we reached the hospital, I was sure the werebear was also on the road to recovery. "What about my girlfriend?" he asked. "Do you think the same thing is happening to her?"

"Probably," I said. "If you can't convince her, why don't you just destroy her cards when she's not looking? Once the effect wears off, she might be more willing to believe you."

The werebear nodded again and climbed out of the car. "Good idea," he said, and there was a briskness to his voice that convinced me we were indeed on the right track.

"Wait a second," I said as he started to shut the door. I scribbled my phone number on a scrap of paper and handed it to him. "Call me and let me know what happens." Even if I wasn't yet back in my house, I could always page the answering machine from a pay phone. Between us, maybe the werebear and I could start an underground movement. Though we'd never be more than partially successful; I couldn't imagine convincing everyone to destroy their IDs.

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Worse, increasing "moreness" was nothing new. The longer I thought about it, the more I wondered if, for years, people might have been gradually being reprogrammed by full moons and solar storms. Maybe that's where zero tolerance and its cousin political correctness had come from in the first place. Maybe MagStrips merely intensified the effect. Perhaps folks like my foil-hatted street person were the only ones who'd felt it happening. If so, the werebear and I might be able to slow the tide, but the worlds of zero tolerance and "moreness" were here to stay.

Sadly, not all of that was leftover paranoia. That night, sleeping in my car, I got a ticket for parking an inch too far from the curb. Luckily, mindless rule-following works both ways: when the cop demanded ID, I pointed out that I didn't need a driver's license to sleep in a parked car—even if it *was* illegally parked. He thought a moment, said, "You're right," and withdrew the request.

Then he called a tow truck. ■

Analog's 75th at the Science Fiction Museum and Hall of Fame

On the weekend of May 5-7, the Science Fiction Museum and Hall of Fame in Seattle hosted two major events: The Eaton Conference and the Science Fiction Hall of Fame Class of 2005 Induction Ceremony. Both events included recognition of this year as the 75th anniversary of *Analog Science Fiction and Fact*, which began publication in January 1930 as *Astounding Stories of Super-Science*.

The Eaton Conference is a gathering of college-level teachers of science fiction and science-fiction-related courses, sponsored by the University of California Riverside and presenting academic papers on a variety of topics. The Friday afternoon session, titled "The Astounding Age: The Past, Present, and Future of SF," included introductory remarks by *Analog* editor Stanley Schmidt, a paper on "Economics and the Real Future of Space" by regular contributor and UC Irvine professor Gregory Benford, and a panel on "The Future of Magazine SF" with Gregory Benford, Charles N. Brown, John Cramer, George Slusser, Eileen Gunn, and Stanley Schmidt.

The Science Fiction Hall of Fame was established in 1996 by the Kansas City Science Fiction and Fantasy Society and the J. Wayne and Elsie M. Gunn Center for the Study of Science Fiction at the University of Kansas, and moved to the Science Fiction Museum when that was opened in 2004. Each year it honors four individuals for their long-time contributions to the science fiction field. This year's inductees were animator Ray Harryhausen, artist Chesley Bonestell (who did, among many other things, covers for this magazine), author Philip K. Dick, and movie director Steven Spielberg. The inductions were announced at a banquet on May 6 with actor Robert Picardo of *Star Trek: Voyager* as MC and Stanley Schmidt presenting a brief slide show of highlights of *Astounding/Analog*'s first 75 years.

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Entropy's Girlfriend

Robert J. Howe

You may have known people like this, without knowing why. . . .

You know what the difference is between Eugene, Oregon, and Manhattan? In Manhattan you can tell when the Grateful Dead is in town by the sudden blossoming of deadheads around Madison Square Garden. Eugene sits on the Willamette River (across I-5 from its blue-collar sister city, Springfield), a valley redoubt of aging hippies in tie-dyed tee shirts, and Volvo-driving health Nazis. Moving to Eugene is what middle class folks do instead of joining the French Foreign Legion: people who wanted to transform their lives; abandon their roots and become someone new, fetched up on the Willamette River's Left Bank.

I was there, a year after my divorce, still feeling like my skin had been peeled off, and not knowing what to do with myself. This was before all the Californians migrated north to take advantage of Oregon's cheap real estate, so it wasn't too hard for an expatriate New Yorker to find work. I was the cops reporter for The *Register-Guard*, which is how I met Starr.

There wasn't a lot of serious crime in Eugene in those days: patrol cops still treated stolen bicycles like jewelry heists, and most of my time was spent writing about DUI arrests and small-time drug busts.

The body is gone, but there's lots of blood and mess and filth. The whole apartment is only two small rooms, and besides the bed—actually just a mattress on the floor—and one metal folding chair, the furnishings are all cardboard boxes full of clothes and junk. The carpet is gritty underfoot, and the wallpaper is spotty and moth-eaten. One wall is badly water stained and mildewed, and there are small holes poked through the drywall in several places. I'm so busy trying to avoid stepping in the pool of blood ("Please don't contaminate the crime scene, sir," the sergeant says) that I somehow knock over a halogen flood

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set up by the detectives. The light doesn't just break, it shatters like a grenade going off, spraying splinters of glass all over the room.

I hold my breath, expecting to be evicted from the scene before I get a single quote. This will provoke the city editor, whose preferred mode of conversation is a "What have we learned from this?" didactic that she must have picked up in a Stalinist reeducation camp.

The detective is a tall, handsome woman with dark brown hair worn in a short bob. She's dressed in khakis, a blue oxford shirt, and a corduroy sports jacket. She has her hands on her hips and she's half-smiling.

"Wow, I've never seen one break like that," she says. "You pretty much reduced that light to its constituent atoms."

I start to apologize, then what she said registers.

"What did you say?"

"You randomized the hell out of that light," she says. "Come over here and stand behind me. Let's see if we can get through this without demolishing the building."

Her name was Starr Banner-Bende, pronounced "bendy," and she was unlike any cop I'd ever known. She talked over her shoulder the whole time she was examining the crime scene. The victim was a white female, between fifty and sixty years old. I filled three pages of who, what, when, where and why without having to ask a single question.

"God, they never learn," she said, straightening up from a crouch.

"They?"

"Women." She stripped off her plastic gloves. "We put two deadbolt locks on the door, locks on every window, and don't list our first names in the phone book, but we stay with guys who use us like punching bags."

"Did her—what, boyfriend? Husband?—kill her?" I asked.

"Well, dollars to donuts." She said. "You know what they tell medical students? When you hear hoofbeats, think horses, not zebras. Everybody's afraid of the next Ted Bundy, or Green River Killer. Meeting a serial killer is about as common as winning the lottery: not very. You're more likely to get struck by lightning. You're much more likely to get stabbed to death in a shitty little apartment by your alcoholic common-law husband."

She pitched her gloves in a biohazard bag the crime scene officers had set up, and told them to watch out for the broken glass on the floor.

I followed Starr out, writing the lead in my head. It was a typical March afternoon: overcast and weepy. I don't think I'd seen the sun since Halloween. We were met in front of the building by most of Eugene's police brass. Any murder in Eugene could bring out the police chief. He was an overly healthy fifty, wearing Dockers and a golf shirt; he had the appearance and officious demeanor of an assistant manager at Wal-Mart.

"What do you have, Bende?" he said, ignoring me.

She gave him the rundown she'd given me, minus the color commentary. "Looks like a domestic," she said. "Single stab wound to the chest. We're still waiting on a landlord or property manager. The mailbox says L. Szabo—that's probably her, but there's no ID on her or in the apartment."

"This your partner?" the chief asked, nodding at me.

"No, Dexter's starting the canvass," she said. "This is Larry Kirwan, he's the reporter for the Red Guard."

You hear people call the newspaper the "Red Guard" because of its supposed leftward slant. It is to laugh: like most chain newspapers in medium-sized markets, the *Register-Guard* is about as radical as a Presbyterian bank manager. The slant is pro-business. If the head of the Chamber of Commerce were found holding a gun over the corpse of a stripper, our headline would be "Nude

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Dancer Smears Reputation of Local Business Leader."

The Wal-Mart manager turned unctuous when he realized I was a reporter. "Give us a minute, would you?" he said. He was annoyed that I knew he didn't recognize his detectives by face, giving me a fake smile for my trouble.

I had to write the story anyway, and made my excuses. I drove back to the office feeling disappointed because Starr had given me the barest of nods when I left, then feeling ridiculous, because what did that matter compared to a dead woman?

Gus did the Happy Dog Dance when I came home: frenzied circles to the left, punctuated by short leaps and excited yips. As usual, I felt guilty for leaving him alone during the work day. He had a doggy door to the back yard, and his Olympic pool-sized water dish, but dogs want to be with the pack. For Gus, I was it. The pack used to be me, Moira and Gus, and he moped for a long while after we moved to Eugene. Sometimes when I opened a dresser drawer or a suitcase, he'd jam his whole head in it, trying to hoover up the tiniest remainder of Moira's scent. I'd stand there with a lump in my throat, petting him and saying "poor Gus."

I took off my work khakis and put on my hanging-around-with-the-dog khakis, and Gus and I went for a walk down by the river. Gus bounded up to every tree, lamppost, and bush as if it were a fleeing cat burglar, then spent endless minutes with his quivering nose pressed close to the surface, before leaving his own contribution on the canine bulletin board.

Moira used to lose her patience with me and Gus during our walks.

"For Christ's sake," she'd say, "just keep walking—he's on the other end of the leash!"

At first I would argue the point. "You walk the dog for the dog's enjoyment, not because you want to get someplace fast," I said once. "We had him neutered and he only gets to eat dog food; let him enjoy his few pleasures, okay?"

In time, though, I said less and less as these little skirmishes metastasized: the way the dishwasher was supposed to be loaded; how the bills were supposed to be paid; why couldn't my friends call before nine o'clock at night. Things always breaking around the house; *that* was a big one.

I didn't appreciate the load of silent resentment I'd accumulated until I was waiting for the subway one morning and a high school kid standing next to me said, "Yo, man, what's that sound?"

It was my teeth grinding.

A few times after that I tried—*we* tried—to talk about what was going on, but by that time the stakes had gotten so high that clearing the air would have meant more of a fight than either of us had the heart for.

The afternoon I found out about Moira's boyfriend was the last time I was in the apartment. The only things I cared about were Gus, my laptop, and an armload of books—Moira had chosen almost everything else in the apartment, anyway. I packed up my stuff and Gus and I headed to my brother's house in Staten Island, though we had to be towed there from the middle of the Verrazano Narrows Bridge after the car broke down.

My brother's mechanic said the engine had seized. "It's like you gotta twenty-year-old engine in a five-year-old car," Tommy said. "Everything was worn to shit."

Gus and I bought a new car and six weeks later we drove across country to Oregon.

The Szabo murder made the front page; par for the course in a town that averages fewer murders in a year than New York City has in a day. And I'd prevailed on the city editor to leave in the zebra quote. It was a good quote, but I wasn't proud of the fact that part of the

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reason I'd used it was to flatter Starr.

I was in my cubicle at the newspaper—gray fabric walls pinned with overlapping clippings and cartoons like a postmodern Altamira—when Starr called.

"You're not going to believe this," she said.

"Believe what?"

"Last night's victim? Linda Szabo? She's a professor at the U of O."

"Retired?" I asked.

"No, tenured. Full professor of physics."

That took some rearranging of the mental furniture; she'd lived in a place a half-step up from a homeless shelter.

"How come . . ." I started to ask, but Starr was ahead of me.

"No idea," she said. "She made a pretty good salary and there's eleven-thousand in her checking account. Drove a nice car; late model Volvo. If I had to guess, I'd say she was a little eccentric, poor thing."

"You have a suspect yet?" I asked, writing madly in my notebook.

"No. It's looking less and less like a boyfriend, too. She lived alone, neighbors say she never had visitors."

My submerged unease about the zebra quote returned. "I don't know if you saw the paper," I said. "I quoted you . . ."

"I saw," she said. "Hoofbeats."

"I'm sorry about that." Rather than flatter her, I'd made her look foolish in print.

"Don't apologize," she said. "I said it was probably a boyfriend, and I expected you to quote me. I've been wrong before."

When I got off the phone with Starr, I collected my notebook and keys and headed over to the University of Oregon. If nothing else, I had to get a few quotes from Szabo's colleagues for the follow-up reaction piece to the murder story. I also wanted to find out if her colleagues had any inkling why the dead professor had been living like a transient.

* * *

I'd been out to the U of O before for the usual college-related crimes: a sexual assault, some minor hazing incidents, and ritual thefts of opposing football teams' mascots. I parked off campus so I wouldn't have to check in with the public relations people, and headed over to Willamette Hall, where the physics department was housed.

The department office was a big, overheated room dominated by a wooden desk that looked like it had been knocked together from packing crates. A doorway led to another, smaller office. The desk was staffed by a twentyish student with raven hair in a Betty Page cut that reminded me of Moira, and prominent facial piercings that didn't. When I came in she was flipping through a Williams Sonoma catalog.

I introduced myself and asked the girl if she'd known Professor Szabo. Only slightly, she said, and made the appropriate sad noises we're supposed to make on such occasions. The person to talk to, she said, was Professor Schenk, another physics professor.

She ran her finger down a schedule paper-clipped to the blotter. "He had a class until eleven-ten," she said, looking at her watch. "He's got office hours until two."

She wrote the office number on a yellow Post-It and handed it to me. "It's up the stairs one flight, I think on the left-hand side," she said. "He might be with a student, though."

Edgar Schenk, it turned out, was a round little Englishman in a sweatpants and running shoes, and a cardigan sweater of an eye-popping orange hue. He was alone in his office—a walk-in closet furnished with a gray steel desk and one of those wooden swivel chairs that looked like it was bought at a *Daily Planet* fire sale. The walls were hung with several framed posters from cowboy westerns.

I introduced myself; he knew that Sz-

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abo had been killed, of course.

"Isn't that a bloody horror?" he said, gesturing me to a chair. "We're just sick over it."

"How well did you know Professor Szabo?" I asked.

"Very," he said. "My wife and I had her for dinner just last week. Linda and I shared the same teaching schedule, more or less, and carpooled—hers was always in the shop."

He picked at some orange fuzz on his sweatpants. "Tragic, tragic waste. I'm sure you hear the same thing every time someone is killed, and I don't mean to diminish anyone's death, but she really was one of a kind."

"How so?"

"Well, she was a delightful person, but I mean she was a first-class mind. She turned down a professorship at The Institute for Advanced Study to be here," he said. "Do you know it?"

I told him that I knew it was in Princeton, New Jersey, and that it was famous for Einstein and a handful of other geniuses.

"Exactly," he said. "The big leagues, as you would say."

"Why was she here, then? Did she like teaching?"

"Oh, heavens no." He laughed a bit. "Linda could have taught anywhere, and as a researcher she was a double threat: very good theorist *and* experimental physicist."

"Did she have a lab on campus?"

"No, she mentioned working at home, but that seems hard to credit, doesn't it? One would have to be of independent means merely to match one our modest laboratories. I'm an experimentalist, myself. Our department is respected for a few things, but rather second-tier. She was well out of *my* class, I can tell you that."

This was an unusual admission, especially from an academic. Schenk had none of the wounded genius about him.

"Why do you say that?" I asked.

"Oh, she helped out on some of my work from time to time," he said. "Superb with equipment; not merely a good troubleshooter, but very talented in design and fabrication."

"Not to be rude," I said, "but if that's all true, why was she here?"

"Filial obligations, apparently. She had family here, though we never met them," he said.

"What was her specialty?"

"She taught the introductory courses in undergraduate physics, and one or two sections of quantum physics," he said. "But she was a mathematical theorist at heart.

"She would talk to me about her work, and I'd be able to follow her so far and no further. And I'm considered a rather bright fellow." Schenk's expression was sad. "I'm telling tales out of school, but I think it was her personal life that held Linda back. She could never seem to get organized to publish anything. Certainly nothing is the past five years."

"Could you describe, in general terms, what she was working on?" I asked.

"I can't describe it to you in anything *but* general terms, I'm afraid. She was interested in something she called 'LEDs,' Localized Entropic Disturbances: regions of space where the quality of the energy is completely degraded—you can get no further work from it.

"It's an interesting concept," he said, "and somewhat contradictory. Pockets of entropy contained within a system, but not affected by, or affecting it. As if you placed a cup of frigid liquid in a hot oven, and the liquid doesn't warm, nor does the oven cool. But I never saw the mathematics that underpinned the theory."

That was just as well. I'd taken calculus in college, but all I could remember about the class was the smell of Marybeth O'Halloran's shampoo; she sat in front of me, and her long hair brushed the edge of my desk for two tantalizing semesters.

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"Where do these pockets of entropy come from? And how big are they—are we talking microscopic?"

"Oh, heavens," Schenk made a frustrated gesture. "We're discussing theory: who knows how large they would be in the real world, if they occur at all. Linda believed that they were counterbalanced by dark energy in another dimension.

"Again this is all very speculative and non-mathematical," he hastened to say. "It occurs to me this is not the kind of thing you should put in the newspaper; it would seem perfectly lurid, and unfair to her reputation."

Schenk talked a bit more about Szabo's work, off the record, but I was starting to lose the trail. When he came up for air, I finished up the bread-and-butter questions—his wife's name, what she did, where he went to school and the like—then made my excuses.

Before I left, he pulled a videocassette off the shelf and handed it to me. "You might find this useful," he said. "It's a tape of Linda teaching, from this past semester."

I thanked him and went to see the university's head flack for the official line on Szabo's death. She was probably a little put out that I'd talked to Schenk without her say-so, but she was smart enough not to comment on it.

The eternal Eugene drizzle had resumed while I was inside. Nonetheless, I took the long way back to my car. I wanted to think about what Schenk said, and even in the rain, I enjoyed being away from the office. The vast majority of a newspaper reporter's working hours are spent on the phone, in one of the cubicle farms that have replaced open newsrooms in the last decade. It was a trend I resisted, sometimes to the city editor's annoyance.

Besides the weepy skies and an occasional gust of wind, it was a pleasant spring day. The temperature was in the sixties, and the air had the dense, heady smell of blooming plant life. Eugene is in the middle of the Willamette Valley, a north-south floodplain between the Coastal and Cascade Ranges. The Cascade Mountains trap the warm, moist Pacific weather in the valley, making it like an open-air greenhouse.

Eugene had it all over New York in the nature department. The streets near the university were lined with huge old trees—ash, chestnut, beech, bigleaf maples, and probably a half-dozen different kinds of evergreen: spruce, fir, pine and juniper. The trunks were rimed with moss, and the rain made a soothing noise on the dense foliage.

I went back over the interview in my head, not writing the story so much as digesting the information. Schenk said that Szabo's car was always in the shop, but Starr had mentioned that the dead professor owned a new car. Something else about the car teased at me, but I couldn't quite pin it down.

Then there was the physics. I have a good layman's grasp of science, and I try to keep up with the big ideas in physics, in a non-mathematical way. In another life I'd have been a science writer, but newspaper journalism, the last bastion of the well-read generalist, was increasingly dominated by experts. Postdocs were covering the science beats at big papers, not guys who'd dual-majored in physics and journalism at a state college.

Even with my imperfect knowledge of the field, I knew that if Schenk was describing the dead professor's theory accurately, and if the theory panned out, it could have huge implications. Two big ifs, but still. On the other hand, like a lot of theoretical physics, it sounded almost laughable when you tried to describe it in layman's terms. For a split second I wondered if Szabo had been killed because of her work, but in that direction lay the Grassy Knoll and the Freemasons' secret plot to rule the world.

By the time I got back to my car, I was wet through to my undershirt. Of course the car wouldn't start, and I had to wait forty-five minutes for a service

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call.

I spent the rest of the day trying to track down relatives of Szabo—neither the university nor the cops knew of any—but by deadline I hadn't turned up anyone. That was a relief, mainly. At best talking to victims' relatives was sad; at worst you had the awful job of breaking the news to them.

In the next few days I only wrote one brief follow-up on the murder ("Police say they are actively investigating . . ."), and covered routine small-city stories: a downed tree that crushed several unoccupied cars (a surprisingly frequent occurrence—Eugene was full of big old trees, and every time there was a strong wind, some of them came down); a trailer park fire in Springfield caused by an exploding methamphetamine lab; and racist graffiti on Skinner Butte, a flat-topped hill that was a popular makeout spot for teenagers. Then I covered a story you could only imagine in Eugene: the annual hijacking of shopping carts from local supermarkets by Grateful Dead fans.

The Deadheads who followed the band from city to city mostly weren't prosperous enough to stay in hotels, and they'd camp out for the duration in the city parks. Upon their arrival, the camp followers would go to the local Safeway or Albertsons, stock up on several days' worth of food and drink, then push their laden carts down to their campsites by the river. Once there, the carts became part of the Deadhead city infrastructure until the band followers decamped. The day after the band left, the supermarket chains would send out trucks to reclaim their missing carts.

The whole time I was writing the piece, I was trying to imagine how this would play out in New York. All I could picture was skinny guys in tie-dyed tee shirts getting clubbed like baby seals by irate grocery store managers.

I came across the videotape Scheck gave me when Gus and I were cleaning out the car. I was actually cleaning; Gus was sniffing the floor mats for microscopic particles of fast food.

I made a quick dinner and sat in front of the television to watch the tape. It was a slightly better than average quality production: Szabo was wearing a clip-on microphone, and the lecture hall had two huge skylights that let in the mid-September sunlight.

I'd arrived at the crime scene after Szabo's body had been removed, and the only picture I'd seen of her was the head shot from her university ID card, from which I could tell she was a Caucasian female over thirty, and not much else.

In the videotape, Szabo was a trim, animated woman. She wore khaki pants, a bright red tee shirt, and black canvas sneakers—she neither looked nor moved like someone over forty. If she didn't enjoy teaching, she was a superb actor.

The class was a basic physics-for-poets lecture course. On the tape, Szabo was outlining the Doppler effect to about fifty students. A few hands went up while she was explaining wavelength.

"Hold your questions until the end," she told the class. "Then I'll explain everything. In the universe."

The students laughed and the hands came down. Szabo riffed along for fifty minutes, giving a concise explanation of the Doppler effect and its implications for cosmology. She was entertaining without being a ham, and she explained basic physics without condescending to the class.

When the lecture was over, about a dozen students clustered around her desk. The students weren't miked, so most of their comments were unintelligible, but you could tell from their happy, animated faces that their questions were secondary: they just wanted to be near her. Some professors had that gift, and Szabo had it in spades.

I'd covered a lot of murders in New York, and I never knew the victims.

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Even through their families' grief, I rarely got a sense of the dead person more revealing than the abstractions you read in the newspaper: "young mother of three," "hardworking immigrant from Guyana," or "beloved neighborhood fixture."

Szabo, suddenly and sadly, had become a real person to me. I also felt uneasy that her death seemed more appalling to me because she was smart and attractive and funny. The heart isn't always noble and egalitarian, but I didn't like having my nose rubbed in it.

When I called Starr to see if there were any new developments in the Szabo murder, she told me to meet her and her partner for lunch at a place called Machismo Mouse, downtown.

Starr was already there when I arrived: I'd had to stop to change a flat tire. The restaurant was a Mexican health food cantina. About two-thirds of the menu items had little "heart healthy" graphics printed next to them. My idea of health food was French fries *without* melted cheese on them. I wasn't going to complain, of course; I was happy to spend time chatting up Starr before her partner arrived. It gave me a chance to ask her something that hadn't occurred to me at Linda Szabo's house.

"How did you know my name?"

Starr looked up from the menu. "I saw your notebook, and I knew your byline, and your reputation."

"My reputation?" In my mind's eye I could see the halogen lamp crashing into the crime scene.

"We tend to get two kinds of reporters on the cops beat," she said. "The police buff and the noble reformer: one thinks cops can do no wrong; the other thinks we're all knuckle-dragging sadists. You don't have a reputation as either type."

I felt caught between the implied compliment and the need to defend my profession—even though I knew what Starr was talking about. I'd seen my share of cops reporters who carried "courtesy badges" and had revolving blue lights for their car dashboards. I'd also known a few reporters who treated cops with the kind of suspicion and contempt most people reserve for child pornographers.

"Thanks, I guess," I said, "but most reporters are pretty evenhanded. Anyway, I never noticed that I had any special friends on the job."

"Yeah?" Starr said, smiling enigmatically. "I'm not so sure. Most cops are like high school kids: peer pressure rules their lives. They respect a guy who can go his own way without being a jerk about it."

Starr turned her attention back to the menu. She must have read my mind about the "heart healthy" offerings. "It's pretty thin stuff," she said, "but if you only order the fried food, you can cobble together an okay meal."

We ordered sodas and pretty soon Starr was grilling me. I got a few tidbits from her: Banner-Bende was a family name; no, she wasn't married; the jury was still out on kids, but she thought not—it would avoid having to choose which of three surnames they would bear.

Mostly, though, we talked about me. Where I grew up, where I went to school (she looked very interested when I said I'd dual-majored in physics and journalism), where I'd worked. I told her about being a cops reporter in New York, though I laid off the usual war stories, not least because I knew they wouldn't impress her. I gathered she'd been born and raised in rural Oregon, but she was more worldly than a lot of New Yorkers, and I knew the country mouse-city mouse thing wasn't going to play well.

When it comes to Moira's and my marriage, I tried to follow Emerson's advice: *In skating over thin ice our safety is in our speed.*

"Divorced, huh. What happened?" she asked.

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"The usual things," I said. It's what I always said, because women always asked. It was what I could say on autopilot, because every time, *every time*, the mental image that question evoked was my naked wife's reproachful glare over the back of the couch, when I walked in on her and her lover.

"Larry, there *are* no usual things," Starr said. "You didn't have kids?"

"No, but I got the dog. Gus."

"Gus?" she said. "I'm sure he'll be a comfort to you in your old age. What kind of dog is he?"

"Don't make fun," I said. "It's short for Augustus. He's a mixed breed, mainly Lab, but I think there's a Chihuahua back in the woodpile somewhere."

Starr's partner arrived then, which saved me from showing Starr a picture of my dog, which I was prepared to do.

Byron Dexter was a small, fortyish guy with a thick beard and thinning hair. He had on the inevitable sports jacket, to cover his holster, and a pair of honest-to-god earth shoes.

West coast cops tend to have a different style than their New York counterparts. More "Please, sir" and "No, ma'am," less "Yeah, I'm talkin' to you, pinhead," at least in polite company. But I was beginning to think Eugene was the Island of Misfit Cops. Even for the west coast, Dexter was different. He had none of the cop's reserve; that vaguely hostile look they have because they're weighing everything you say to see if you're telling the truth.

They brought me up to speed on what they'd discovered about Szabo, which wasn't much. According to the coroner, the cause of death was a stab wound to the chest, severing the aorta just above the heart. The weapon was unknown, but likely some kind of tool: the stab wound had irregular margins and there was some metallic grit in the cavity. Blood and tissue samples were pending. Neighbors heard nothing and never observed visitors to the apartment.

"But get this," Starr said, "Dex and I checked out the other apartments in her building while we were canvassing. Guess what? Every one of them was immaculate: no water leaks, no crumbling drywall, carpets like new. The landlord is in the middle of refurbishing the apartments as they go vacant—"

"Was he trying to get Szabo out?" I asked. More than one New York landlord had tried to terrorize tenants to leave rent controlled apartments.

"No," said Dexter, "You're one-eighty off: Szabo's apartment had already been renovated—it was the second newest one in the building."

"That shithole?" I said, a little too loudly, earning me a scathing look from a woman with a young kid at the next table.

"Hard to believe, huh?" Starr said. "I don't know what she could've done to run the place down so badly."

The food came while I was telling them about my conversation with Schenk, the videotape, and Szabo's localized entropic disturbances. Starr seemed very interested in Szabo's work, and I flipped though my notebook to make sure I'd covered everything.

"Yeah, he also mentioned Heisenberg and observer-mediated events," I said, reading my notes.

"In relation to localized entropic disturbances?" Starr asked? She used the phrase in an unforced way, and I had the gut feeling she didn't use its acronym because she didn't want to confuse me.

"I don't know," I said. "Why? What do you know about this—should there be a connection?"

She looked at Dexter, who was plainly bored by the physics conversation.

"Well, it would be big news if localized entropic disturbances were mediated by observers," she said. "Like Schroedinger's cat, you know—until the observer opens the box, the cat is neither dead or alive."

I nodded to show that I was following her.

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"If human observers could trigger localized entropic disturbances . . ." she trailed off.

"On the one hand, it all sounds a little *Dancing Wu Li Masters*," she said. "People who understand neither physics nor Buddhism are always trying to arrange a mystic union of the two. Still, I can't immediately see any reason why localized entropic disturbances *wouldn't* be observer-mediated."

It felt not a little strange to be lectured on quantum physics by a cop. I had about ten thousand questions to ask her about her background and education, but Dexter was standing up and pulling a portable radio from his coat.

He spoke briefly into the radio, then to me.

"We have to go," he said, shaking my hand. He nodded at Starr. "She thinks you're interesting. God help you now."

I looked at Starr, expecting her to be as surprised as I was, or at least annoyed, but she seemed completely unruffled—she was already up, ready to go. As she left the table, she bumped me affectionately with her hip.

"Ciao, Larry. We'll get to the bottom of your dog problem next time."

I sat there for another minute, feeling happy and a little spent. It wasn't just the attraction I was feeling (and hooray! it appeared to be reciprocated). My pleasure in Starr's company was edged with sadness about Linda Szabo. I hadn't said much about the tape, but I felt a strange reluctance to hand it over when they asked to borrow it—even though I'd brought it to lunch with that in mind. It was silly, but I wanted to keep it for myself.

And even though I'd dodged the Moira topic by talking about Gus, there was no small-talking Starr. She thought quantum physics was light table conversation.

While I was waiting for the waitress to come and get the check, I thought to myself, "Don't screw this up."

* * *

The good thing about being a cops reporter is that I'm spared from attending city council meetings and community board hearings, which are mostly hobbies for the self-important and self-deluded.

The bad thing is that I spend too much time exposed to the spectrum of human suffering, from stolen backpacks to dead women. A teenaged boy in baggy pants was handcuffed to a bench at the University West station. He's sobbing so hard that his tee shirt is wet with tears and snot.

"What his story?" I ask the desk sergeant.

"He smashed his friend's face open with a skateboard," the sergeant says. "Over a pack of cigarettes. The kid's going to need plastic surgery." He leans over the desk toward the teen, "Hey, Sage, you're sixteen—you know what that means."

We all do: he's old enough to be tried as an adult.

"I don't care. He's my bud, man! This is messed up!"

The kid seems genuinely upset about his friend, to the point where his crying is penetrating what Moira called my Curtain of Numbness. I write down the who, what and where from the blotter (which is actually a carbonless booking form), and move to get away from the teen's sobbing and the sick feeling in the pit of my stomach.

I'm leaving the station and it happens: just as I pass by a head-high display case of trophies and plaques, the top shelf lets go, and an avalanche of wood and metal crashes to the bottom of the case. Even though the Plexiglas front holds everything in, it is an impressive noise.

The wailing teenager is silenced, and four cops come rushing from the back of the station to stand at the desk and goggle.

"Je-sus," the sergeant says. "What did you *do*?"

"I didn't touch it," I say. I'm shaken, as always, by the violence of the mishap,

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and by being jerked back to my childhood where my father glares at me over some irreparably shattered household item. That I *didn't* touch the case is irrelevant, as it was then.

"I wasn't . . ." I start to say, but the sergeant cuts me off.

"Never mind," he says. "Just don't touch anything else on the way out."

I stifle the impulse to defend myself, and walk out, face burning with embarrassment.

"Hey, Larry, I hear you demolished the University West station yesterday."

It was Starr, on the phone, having woken me from a sound sleep at six in the morning.

"Very funny. News travels fast," I said. I didn't ask how she got my home number—it wasn't listed, but she was a detective, after all. It did make me wonder a little bit what else she knew about me. "Did you wake me up just to rub it in?"

"That, and I'm driving over to Bend to look at Szabo's car. Want to ride along?"

"Bend? What's her car doing there?" I said. Bend was more than a hundred miles from Eugene, on the other side of the Cascade Range.

"Broke down there," Starr said. "She was on a hiking trip. It's been sitting in a garage since a week before she died—I guess she was supposed to pick it up this weekend. One condition though: anything I find is off the record until I say so."

Sometimes you have to make these tradeoffs with cops. Starr and her partner had been very free with their information so far. And if I didn't go along for the ride, I would certainly get nothing that Starr didn't want me to have.

"What time are we leaving?" I said. If the car turned up some clue to Linda Szabo's death, I wanted to be there, and I would get to spend a few hours with Starr.

"I'll pick you up in ten minutes," she said. "I'm buying us coffee now. How do you take yours?"

"You don't already know? Milk and sugar."

"Fine. Don't dawdle," she said, and hung up.

I put Gus out back and jumped in the shower. I was dressed and he was pursuing the last bite of kibble across the kitchen floor when Starr knocked.

When I opened the door, Gus was all over her.

"Oh, look, you horribly deformed dog!" Starr said, in the tone of voice that Publisher's Clearinghouse winners use to greet the Prize Patrol. While she talked to Gus, Starr roughhoused with him.

Gus, of course, was transported, and licked Starr so enthusiastically that she had to wash her face before we could leave.

Wound up as he was, I had to shuffle backwards through the door to keep Gus from crashing out after us.

"He can come," Starr said.

"Are you sure?"

"Yeah, we can split the driving three ways," she said.

I grabbed Gus's leash off the coathook, which made him dance around me in frenzied little leaps. It was hard to tell which of us was happier.

Starr's car was a 1970s vintage Chevy station wagon, full-sized and in mint condition. The vinyl bench seats didn't have an ounce of sag in them.

"This is some ride," I said, imagining how much a vehicle restored to such perfect condition was worth. "Are you sure we should take Gus?"

"Thanks!" she said. "I do like old things. Gus will be a perfect gentleman, I'm sure."

I got another pleasant surprise when I tasted my coffee: it was plain old diner brew, not bitter, overpriced boutique coffee. I sipped while Starr headed us east. I felt guilty at being so content, on our way to inspect the car of a murdered woman.

We climbed Route 126 into the Cascades under a lowering sky. Even with

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the windshield wipers on the intermittent setting, Starr had to continually adjust their speed as we passed through patches of rain. Soon we were in a tunnel of smeary fog bordered by dark evergreen forest on either side. Gus had curled up in the back seat for a nap after liberally depositing nose prints on the rear windows.

"So what happened yesterday at the station?" Starr wanted to know.

I told her about the teenager, and about the way the interior of the display case self-destructed. "The thing just let go as I was passing," I said. "I was distracted by the kid yelling at the sergeant, but I know I didn't touch the case. I was at least a foot away from it when I walked out. I'm sure that's not what the sergeant said."

"Well, you know, he's a highly trained observer," Starr said, "which means he probably has no idea what he saw."

That made me laugh a little. It was suddenly important that Starr believe me about the incident, trivial though it was.

"This kind of thing always happens to me," I blurted out, without really intending to. "When I was a kid I had a reputation for being accident prone. The kids in grade school called me Crash."

Starr nodded but didn't say anything. I could hear Moira saying "Too much information," in the irritated tone she used when I was telling her something she didn't want to hear.

I'm blowing this, I thought.

"I don't think you hit that display case—even Marin, the sergeant, said he didn't think you were anywhere near it—but these things don't just happen to you," Starr finally said.

"What do you mean?"

She glanced away from the road to look at me. "You remember the light at the crime scene—"

"Yeah, I remember it," I said, cutting her off. I could feel my face heating up.

"I was watching you when you came in," she said. "You were looking down at the floor, but I was looking at you, thinking, 'Who is this handsome devil?' You weren't anywhere near that light when it went over."

"What?" This wasn't what I expected, to say the least. "But you said I randomized it . . ."

"I was just teasing you," she said. "I couldn't pretend I didn't notice. But that light breaking didn't just happen. You didn't touch it, but now I'm pretty sure you made it fall."

"How is that?" She didn't sound accusatory, which made it a little easier for me to think about the incident.

"I don't know," she said. "But if this has been happening to you since you were a kid. You know: when you hear hoofbeats . . ." She glanced at me again and shrugged. "There are no accidents, I firmly believe."

There are no accidents. Moira and I had gone to couples counseling a handful of times, when we still thought we could salvage things. In one session Moira was furious about a cracked coffee mug. I'd already apologized several times. I didn't bother saying I hadn't touched the mug: I just said it was an accident.

"There are no accidents," the therapist had said.

Hearing the same words from Starr brought back the bitter taste of anger and guilt I'd swallowed in the therapist's office. It was hard to say anything that wouldn't sound defensive and angry, so I just sat there, watching the fog slip by.

After a while, we came to the junction with 242, a narrow, two-lane road that split off from Route 126 where it looped north. We weren't on the new road very long when the sky began to lighten, then we broke through the upper edge of the clouds. We were near the summit of one of the Three Sisters, a trio of 10,000-foot peaks in the Cascades. The sky was electric blue, and the sun pouring though the windshield noticeably raised the temperature in the

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car. The surrounding forest had thinned considerably; what trees there were had a scrubby, windblown appearance.

A few minutes later, Starr pulled into a scenic overlook. "You've got to see this," she said. "It's worth the drive all by itself." Her tone was friendly and matter-of fact, as if I hadn't spent the last quarter hour in a sulk. I felt like an idiot.

Ours was the only car in the small pull-off. While Gus proceeded to memorize the scent of every bush and blade of grass, Starr and I looked west over the Willamette Valley.

The view really was exceptional, even for a state that has an abundance of breathtaking views. Green and brown mountain peaks sat like islands in the dense white sea of cloud that covered the valley. The bright blue sky shaded toward violet at the horizon, and the tips of the Coastal Range, some seventy miles to the west, stood out sharply in the clear air.

The last of my resentment ebbed away as we stood there looking out over the valley. I was working myself up to apologizing when Starr took my hand.

It seemed a miracle that I hadn't blown my chances with her. She was leaning into me slightly and had a soft expression on her face. I was so nervous I barely breathed. I was almost relieved when Gus came up, nosing our clasped hands and wriggling his body between our legs.

A-Bend Auto Repair was on a narrow two-way street near the edge of town. It was a typical small-town gas station, except that the gas pumps had portraits painted on them. One looked a little like Ernest Hemingway.

We went into the office to talk to the owner of the gas station, a tall middle-aged guy with a blond crewcut and an overhanging belly that hid his belt buckle. His desk was a litter of half-empty coffee cups, forms, and tools. Next to the rotary-dial telephone was a well-read copy of the *Paris Review*, its cover marked with greasy black fingerprints.

We introduced ourselves, and Earl, the owner, wiped his hands with a red shop rag before shaking hands. He ushered us outside to a picnic table next to the garage.

"More room out here," Earl said. He opened a plastic cooler next to the table. "Can I get you a pop? All I got is orange Fanta, but it's nice and cold."

We took the sodas, and Starr explained why we were there. Earl knew from the papers that Szabo was dead—the Portland Oregonian had picked up the story.

"She seemed nice enough," Earl said. "I wish I'd known she was a physics professor."

"Why is that?" Starr asked.

"I was listening to a science program on the BBC," he said, "and the physicist they were interviewing said that every event that *could* happen—like Kennedy losing to Nixon, or Elvis not dying—*has* happened in an alternate universe."

In ten years of being a newspaper reporter I've been buttonholed by more than my share of crackpots. I was fairly sure we were headed for the neighborhood of make-believe, but this wasn't my interview, and I kept my face impassive and let Starr take the lead.

"Uh-huh," she urged him on.

"Well, energy and matter can't be created or destroyed—that's the first law of thermodynamics, right?" he said. "How do parallel universes not violate that?"

I looked blank, I guess, which he took for encouragement.

"Say you have a world where Hitler gets into art school, right?"

"Okay."

"And one where Hitler does invade England, and everyone east of Greenland now speaks German. And, just for the sake of argument, another world where Hitler builds the atomic bomb first. Counting the world we live in, that's four different worlds altogether, right?"

"Yes," I said.

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"Where does all the energy and mass—they're the same thing—where does it come from?"

"All what energy and mass?"

"There's now four complete universes, all with a different Hitler," he said. "Where do all the extra atoms that make up everything in those universes come from?

"If every event in the world is a branching-off point," he went on, "you get to an infinite number of worlds pretty quick. So you somehow have to create mass-energy out of nothing, every time a world branches off."

He spread his hands. "See the problem? Either an infinite number of universes already exists, everything is predestined, or we live in a world where every choice eliminates its opposites."

"Which do you believe?" Starr asked him.

"The universe is a palimpsest, friends," he said. "Every now and then we have to erase the blackboard to write some new equations."

I had assumed that Earl was some redneck crackpot. Not only wasn't he crazy, he posed questions that I hadn't thought of, and couldn't answer. I was starting to be a little freaked out by the number of amateur physicists I was running into, beginning with Starr herself.

Other than his reflections on quantum physics, Earl didn't have much to say about Linda Szabo. Her car's fan belt had broken, which had caused the car to overheat and the water pump to seize. She'd had the car towed to Earl's garage, and had driven a rental car back to Eugene the same night.

From a crime-scene point of view, the car was a disappointment. There was nothing in the glove compartment but an Oregon state map, some hiker's maps of the Cascades, and the owner's manual. The trunk held only the usual donut spare and folding jack, a pair of boots and an empty water bottle. The car's interior was immaculate. It still had that carcinogenic new-car smell caused by outgassing from plastic components. Szabo was a hiker, so said Professor Schenk and other colleagues Starr had interviewed, and that was likely what had brought her to Bend.

Starr bagged the personal effects for evidence, and made arrangements for the car to be towed to Eugene and impounded until some next-of-kin was located to put Szabo's affairs in order. The professor had charged the repairs to her credit card, so Earl wasn't out anything except a few days' storage fees.

Earl stood with us while Gus took his sniff-and-pee break. "Are you going to catch the guy who killed her?" he asked Starr.

"I hope so," she said. "Our chances would be better if it were someone who knew her, but that's looking less and less likely."

Earl put his hands in his pockets and looked at the ground. He looked like a little boy.

We were both quiet as we headed back to Eugene. As soon as we crested the Cascades and descended back into the Willamette Valley's cloud cover, the rain resumed—an unusually steady downpour that made a noise on the car's roof like tearing denim.

"You don't think you're going to catch the killer?" I finally said.

Something in my tone of voice made Starr glance over at me. "It really got to you, huh?"

"Did you see the videotape?"

"Yes. Odd that she looked so young on the tape; when the coroner took her out of the apartment she looked like an old lady," she said. "Anyway, I watched as much of the tape as I could stand. Beyond a certain point I knew I wasn't going to get any new information from it, and that it was an exercise in self-flagellation. You watched the whole thing?"

"I couldn't stop," I said. "I've covered enough murders, but . . . She wasn't what I expected. Maybe I was too detached before; my ex-wife certainly

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thought so."

"That would be the lovely Moira," Starr said.

"Yes." Why the hell had I brought up my ex-wife? "You didn't answer my question, though. You don't think you're going to catch the guy who killed Szabo?"

"I don't know," she said. "I wasn't thinking about that."

"No? What were you thinking about?"

"Physics," she said. "What our friend Earl said about erasing the blackboard."

"Why do you know so much about physics?" I asked. "I've known some smart cops, but all together they wouldn't know enough physics to fill a short comic book. And frankly, I'm a little unnerved by a garage mechanic who's also a physics buff."

"I don't think meeting our friend back there was a coincidence," she said.

"I know: there are no accidents."

"Correct," she said. "Though it's not your tendencies I'm referring to: I have a talent for stumbling across missing puzzle pieces."

"Yeah? What puzzle does Earl belong to?"

"I'd let you get this at your own pace, but I think you need to face the rest of it now, or you'll be full of regrets."

"The rest of it?" I said.

"On the way out here, I said that these accidents that seem to happen around you aren't accidental," Starr said. "I don't think they are. I think you cause them, though you're not in control of them."

"I don't understand—" I started to say, but Starr cut me off.

"Wait, let me finish," she said. "I'm not saying you want these things to happen, but they do, generally when you're under some kind of emotional stress. Am I right?"

I nodded. Let her get it all out at once.

"And we have a professor who's got a theory of localized entropic disturbances dead, in an apartment that looks like it was exposed to the weather for fifty years. And Earl back there, and you and I, who both know some physics. There are no accidents."

That damn phrase again. "That sounds awfully mystical," I say. "Especially for a cop whose hobby is quantum mechanics. The world is full of coincidences. We're a long way here from cause and effect." I'm not convincing Starr, though. I'm not even convincing myself.

"The world is full of coincidences, yes," she says. "But if I grab a guy with three robbery priors down the street from a mugging, I don't think, 'Aha! Coincidence!'"

I feel sick. "So I'm a suspect all of a sudden?"

"*No!* How could you even think that?" Starr says. She sounds genuinely surprised. "I'm just saying people's actions aren't random. It's not—"

Whatever it isn't, Starr doesn't finish the thought. The passenger-side windshield wiper lets go at that instant, making a loud clattering noise against the glass.

"We shouldn't be having this talk while we're driving," Starr says.

In any case, the broken wiper is too distracting to permit conversation. The next exit, for Leaburg, is just ahead. Starr pulls off the highway and into a McDonald's parking lot.

"You want to buy us some coffee?" Starr said, once she shut off the car.

"Are you sure you're not going to leave me here?"

"Hey Gus, dad made a funny," Starr said. "Just milk in mine, please."

When I got back to the car, Starr was standing in the pouring rain, working on the windshield wiper. Gus was watching from the passenger seat.

"You're getting soaked," I said, handing her a cup.

Starr squeezed a little roll of skin on her forearm between her thumb and forefinger. "See this?" she said. "Water-

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proof."

Inside the car, Starr handed me the remains of the wiper blade. "Check that out," she said.

The rubber was stiff and crumbly. "Time for new blades, I guess."

"Guess again," she said. "I don't think the blades are six months old. And the driver's side is fine. If this isn't a localized entropic disturbance, I'll kiss Gus on the lips."

"You're only looking for an excuse," I said, but that was just my mouth on autopilot. In my mind's eye, I could see my car grinding to a stop on the upper deck of the Verrazano Narrows Bridge after I'd found Moira on the couch with her lover.

I had a kind of loose feeling in the pit of my stomach. I've heard people describe dreams in which they were naked in front of an audience. I've never had one of those dreams, but I knew how they felt.

"I don't know, Starr," I finally said. "I have to think about this."

"I bet you do," she said, not unkindly. "I don't know what it all means, but you're handling it better than I would."

I wasn't so sure.

Starr had a small tool kit in the trunk, and we removed the wiper arm so it wouldn't scratch the glass. Gus took another pee break, then muddied the back seat with paw prints when he got back in the car.

"If you pop the trunk I'll get a rag and clean it up," I said.

"Nah, it's just mud—I'll let it dry and vacuum it out later."

The way the rain was coming down, I didn't think the car would dry out until August, but I let it go.

I was lost in my own thoughts for the rest of the drive, looking at all the "accidents" in my life with a fresh eye. It made a hell of a blooper reel.

When we pulled up in front of my place, Starr put the car in park and turned to me.

"It wasn't an accident that you showed up to cover Szabo's murder," she said. "It wasn't an accident that I was there, either."

I nodded, not really taking in what she was saying. All I wanted to do was get out of my wet clothes, into bed, and pull the covers over my head. I got Gus out of the car, and when I leaned in the door to say goodnight, she gave me a firm, chaste kiss on the lips. I barely responded.

As I walked around behind Starr's car, I noticed she had a bumper sticker to the right of the license plate: "From Chaos, Order."

Right, I thought. That's easy for you to say.

The next day at work I was so distracted I did something I hadn't done since J-school: I blew a deadline. My watch had stopped—I'm pretty tough on wristwatches—and I was catching up on some administrative paperwork when I noticed the time on the wall clock. It was just routine police blotter stuff, but I had to sit through twenty minutes of city editor reeducation camp before I was allowed to go home for the evening.

When I got home, Gus had gotten into the trash I'd forgotten to take out, and dragged it all through the house. I yelled at Gus, even though it was my fault. That sent him under the bed, something he hadn't done since the bad old days when Moira and I were fighting.

I coaxed him out and told him he was a good dog, no doubt confusing the hell out of him. I've never been much of a drinker, which that night I thought was a handicap. I desperately needed to get out of my head for a while.

I tried watching a movie on cable, but my mind kept circling around entropic disturbances. If I tried to focus on what Starr had said, or my history of accidents, or any of it, my attention would skip off in another direction, like a flat

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stone off the surface of a pond.

Finally I put on sweats, put a Billy Bragg album in my portable CD player, and went for a run. It wasn't raining, but the fog was so dense that I was soaked to the skin before I'd gotten to the corner.

I went charging down High Street, toward the river, in the dark, with the music blasting at full volume in my head. I slowed a little when I got to the greenway along the Willamette and turned onto the path heading west. Between the thudding of my heart, the music, and the thick veil of fog that hung from lamppost to lamppost, I felt completely cut off from the rest of the universe.

It took me almost half an hour to run a three-mile loop that ended on my street. I walked the last hundred yards on shaky legs, then collapsed on my front steps.

When I took off the headphones my ears rang in the foggy silence. I sat there for twenty minutes, letting my pulse drop back to normal and not thinking of anything at all.

When I could stand again, I went in and fell into bed, wet, rank and exhausted. I don't think I changed position once all night.

I dreamt about Linda Szabo and Starr. As far as I knew, they'd never met in life, but in my dream they were talking and getting textbooks from adjoining lockers at my high school. The books had strange writing on the covers; I couldn't understand it. I woke confused, thinking if I turned on the light, I'd be able to read the book covers.

I had to climb over Gus to get out of bed. I dug my cell phone from my coat pocket and called Starr.

"Hi." She picked up the phone on one ring and sounded wide awake.

"Where did you go to high school?" I asked.

"I didn't, exactly. I was, well, homeschooled, for lack of a better word."

To my east coast sensibilities, "homeschooled" meant indoctrination by religious fundamentalists who thought their kids would be morally compromised by learning that the Earth was more than 6,000 years old. That didn't square with anything I knew about Starr—though it was beginning to occur to me that I *liked* her a whole lot more than I *knew* her.

"I hear the wheels turning," she said. "I was raised in a convent, by Cistercian Sisters. So it wasn't exactly school, and it wasn't exactly home. When I got to college, it was kind of a shock to me that learning was what you did in school, and that school was like a little job for kids. I'm amazed anyone learns anything that way."

"I have never known anyone who was raised in a convent."

"Yeah," she laughed. "I don't advertise that; it rather deflates the boys. Are you going to tell me why at . . . five-fifty-three in the morning you needed to know where I went to high school?"

"I had a dream about you."

"Was I wearing a naughty little schoolgirl uniform?" she asked.

"No! Not that kind of dream. That must've been some convent," I said. "I dreamed about you and Szabo—it seemed important, but now I don't know why." I was completely awake by then, and a little embarrassed at having called Starr so early in the morning to tell her about a dream.

"I'm sorry I got you up," I said.

"You can make it up to me with breakfast. I am especially fond of bagels with walnut raisin cream cheese."

I took a quick shower and swung by Humble Bagel on my way to Starr's place. She lived on a small block of old houses just south of the university. The rising sun hadn't gotten above the cloud layer yet, and the new leaves of the elm and white oak trees that lined the street glowed green in the quiet morning air.

Starr's place was a two-story Victorian that looked like it had been freshly paint-

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ed. She met me at the door in a pair of jeans, a Lone Ranger tee-shirt, and a Eugene Emeralds baseball cap.

"I love room service," she said. "Let's eat while the sun is still in the kitchen. I'll give you the nickel tour later."

She poured coffee from an old-fashioned metal percolator into thick, mismatched mugs with obscure crests glazed onto their exteriors. The coffee was scalding, and I added more milk from a creamer shaped like a sitting cow. I looked around the kitchen while she put out juice and the bagels and cream cheese I'd bought. Everything in the room was old-fashioned but well cared for, including linoleum carpeting in a style I hadn't seen since childhood visits to my grandmother's house. The overall effect was cheery and comfortable; what nostalgia-themed restaurants shoot for but never achieve.

"I'm glad you called this morning," Starr said when we were sitting across from each other. "I was a little worried about you after our road trip."

The intimacy of the moment made my heart speed up a little. Starr was obviously fresh from the shower and smelled it. Her breasts moved loosely under the Lone Ranger tee shirt, and she was barefoot.

"I still don't know what to think about it," I said. "On the one hand, I have to admit I'm less and less sure about how coincidental my accidents are. I can't quite swallow that I'm causing them, unless it's through clumsiness or half-assed maintenance, or something."

"What about my windshield wiper?" she asked. "And the display case at the police station?"

"You're right," I said. "But what if I am causing these things? I don't know how to stop it." What I couldn't find words for was how terrifyingly out of control that prospect made me feel.

"Anyway, you think my coincidence problem is connected to Szabo's research: that these are . . . localized entropic disturbances?" The term still didn't roll off my tongue naturally. "We don't even know exactly what her theory was: we have a non-mathematical, second-hand description of the theory via Professor Schenk. And I don't see how I contrived to meet you, and Earl, and . . ."

"First of all, I don't think it's *your* coincidence problem, entirely," Starr said. "You met Earl because of me, and you're not the reason I'm interested in physics.

"As far as your accidents being entropic disturbances, though, I have to say we have pretty good experimental evidence," she said. "And Szabo is dead. It still could be a random thing; a push-in robbery or something."

She stopped talking: she could see some penny had dropped for me.

"What?" she finally said, after I sat there agape for a minute. "Tell me!"

"Something you said. At first I resisted the possibility that Szabo's murder had something to do with her work, but now I wonder," I said. "Schenk said that she was a good experimentalist. Suppose she built some kind of device to create these entropic disturbances?"

"And someone killed her for it?" Starr asked.

"I know, I know." I had to smile at her skeptical tone. "Academic politics are vicious, but they're not that vicious. Is the apartment still a crime scene?"

"The seal came off yesterday," Starr said, "but I doubt the landlord has done anything yet."

"Can we go over there? And can you get her EWEB records?" EWEB is the Eugene Water and Electric Board—I wanted a look at Szabo's electric bill.

"Sure," Starr said, "but the records will take a day or so. No, wait: she had a bunch of utility bills in that cardboard box. It's in the property room. Why? What about her power bills?"

"If she did build some kind of device . . ."

"Oh, of course," Starr said. "It probably wasn't solar powered. But why do

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you want to look at the apartment? The crime scene guys cleaned it out."

"I don't know, honestly," I said. "I just don't know what else to do. I'd like to swing by the paper; I want to look over my notebook from that day."

We stopped by the paper first, and I dashed in for my notebook, then Starr and I headed to the EPD property clerk's office.

It took Starr almost twenty minutes to sign out the utility bills—I couldn't go in, since only sworn officers were allowed inside the cage. I spent the time rereading the police report and my notes from the night of Szabo's death. There was nothing in either of them that gave me any new ideas.

When Starr was back in the car, I headed for the apartment building while she looked over the electric use from the last few months.

"Yikes!" she said, almost as soon as she started leafing through the papers. "Big bills: she paid almost five times as much as I do. What did she have in that apartment? Two, three lamps, a small refrigerator. No television, no computer or appliances. I don't think she even had a radio."

I nodded. "I bet she did build some kind of experimental device."

"Okay, let me play the devil's advocate for a minute," Starr said. "Maybe the landlord was pulling some kind of scam on her, and the whole building was being charged through her meter. Maybe she found out and confronted him."

That possibility hadn't occurred to me. "Wasn't the landlord a little guy?"

"I don't know," Starr said. "Dex talked to him, not me. Regardless, it doesn't mean he didn't hire someone to kill Szabo. Besides, if she built some kind of entropy device, where is it?"

"Maybe that's why she went to Bend?" I said.

"To do what with it? Sell it? Give it to someone? Who?" Starr shook her head. "She was a respectable, middle-aged college professor. I don't see her involved in some big intrigue."

"That's another thing," I said. "She wasn't middle-aged, not really. She looked so young and pretty in the tape."

Starr looked at me intently, and I was embarrassed anew by my mild attraction to the dead woman.

"You're right. When they took her out of that apartment she looked twenty years older than she did on the tape," Starr said. "I didn't make that much of it: people who die violent deaths don't leave pretty corpses, usually. But this is different."

I never saw Szabo's body, and I was glad I hadn't. "What are you saying?" I asked.

"You may be right," Starr said. "She built an entropy machine, and it was acting on *her*."

That was an explanation that was both horrible and logical. I had a new sympathy for homicide detectives, who probably were more frequently accustomed to experiencing the exultation of an "ah-hah!" moment with the grim knowledge that it wouldn't bring the victim back.

"Her apartment, too," I said. "That's why it was such a sty."

"Right, *right*!" Starr said. Then, "Oh, god."

"What?"

"It was probably affecting her brain, too. Your source at the U of O said she was having personal problems," Starr said. "The poor thing: she was going crazy."

A kind of entropy-induced dementia. It made sense. We rode the rest of the way to the apartment building in silence.

The landlord, a wizened old Romanian immigrant named Ion Gogean, opened the apartment for us after Starr showed her badge. She asked him a few questions about the utilities, and we looked at the meters, but I could tell she

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didn't believe Szabo had been killed over an electric bill scam.

"We'll come and see you before we go," Starr said to him as he let us in.

"Sure," he said, his accent heavy. "I got only time. No rush. You come get me."

Nothing had been changed: in the room where Szabo had died, the carpet was heavily stained with dried blood. Even though the windows were open, the apartment reeked.

The place was worse in daylight than I remembered it. It did look as if everything in the place had been exposed to the weather for a decade, especially in the room where the body was found. From the expression on her face I could tell Starr was drawing the same conclusion.

"Larry, what do you make of this?" she said, pointing out one of the holes gouged in the sheetrock wall.

"I noticed those," I said. "There are a few of them." As I turned to gesture at the other divots, it came to me. I could see in my mind's eye how Szabo had died.

I went over to the wall and looked at one of the holes: it seemed more recent, had sharper margins, than most of the dings and nicks in the beat-up apartment.

I took a deep breath. "I don't think she was murdered," I said. "I think Linda Szabo killed herself accidentally with her entropy device."

"How?" Starr put her hands on her hips and looked intently at me. At least she wasn't laughing. "And why didn't we find it at the crime scene?"

"You said it must have been acting on Szabo, to make her look so old," I said. "But if she had an entropy device, it must have been acting on itself, too. Why wouldn't it?

"I think it failed catastrophically," I said, "and when it flew apart, it punched these holes in the sheetrock. And Szabo."

"But we still didn't find—oh!" Starr said. "No murder weapon and no pieces of the device because they were randomizing as they hit her. The grit in the stab wound."

"Right," I said. "And the irregular margins of the wound, and these holes. There aren't any holes in the other room, just the walls in here and—" I looked up, "in the ceiling."

"Nobody heard anything, though," Starr said.

"I don't know why nobody heard anything, but I bet it didn't sound like an explosion caused by rapidly expanding gasses," I said. "I think it was a . . . a kind of entropic detonation."

It made sense: the pieces that killed Szabo and dug into the walls stayed intact just long enough to do the damage before they were randomized.

"What about her car?" Starr said. "It was brand new, but it kept breaking down, like . . ."

"I know, I know: like mine," I said. "I thought of that. But remember that the interior was spotless?"

Starr nodded.

"I think she just happened to buy a lemon. Sometimes coincidences *do* occur," I said.

The landlord was intently watching cartoons on television when we returned Szabo's apartment key. He tried to make polite conversation at the door, but it was clear his attention was focused elsewhere.

The sky is fully overcast when we leave Szabo's apartment building, and a wind has sprung up that occasionally rocks the car on its springs. We're both subdued on the drive back to Starr's house. It's good to figure out what happened to Szabo, and that she wasn't murdered, but her death is still a waste. Starr holds my hand the whole way home.

"Can you come in for a while?" Starr asks when we pull up at her house.

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We're halfway to the door when the rain starts to spatter down.

"Hang on a second," I say, and go back to roll up the driver's window. Just as I close the car door and turn back toward Starr, there's an earsplitting crack, like dry lightning.

The wind has caught a desiccated old Norway spruce on the neighbor's lawn, its boughs full of dead needles acting like sails, and snapped its trunk, sending the huge tree crashing down toward Starr.

I'm not close enough to reach her in time, but I'm plenty close enough to see the terror on her face. My heart stops as she disappears in a blizzard of brown spruce needles.

I can't move and I can't look away. Time seems to stop, and my mind is absolutely blank. I can't make sense of what I'm seeing.

Starr is still standing, amid a settling cloud of needles and dust and twigs. It's as if most of the tree has fallen through the earth, somehow missing her completely.

I come back to life when she looks at me, and I see her shoulders start to shake. Then we're holding each other and she's crying and I'm crying, and we're both covered in needles and sawdust.

It was fully two hours before the last firefighter, neighbor, cop, paramedic and newspaper reporter left Starr's house. A short, stolid fire captain with heavy bags under his eyes was the last to leave.

"Rotten old tree," he said, standing at the door. "You're damn lucky, Miss."

Like everyone else, he assumed the tree had missed Starr and shattered against the ground. What other explanation was there?

He said goodbye and headed down the walk to his rig.

We went back to the kitchen and I collapsed into my chair. I felt wrung out and weak. Starr took my hands in both of hers across the table.

"I was so scared," I said. I needed to tell her. "I was scared for you, and for a second I was terrified that I made the tree fall. But it wasn't me."

"I know," Starr said. Her hands were warm on mine, and I felt a little like crying.

"How do you know?" I said. "Because that's what I'm afraid of, all the time, that I'm going to hurt somebody. That I'm going to hurt *you*."

"I think you're right: you can't stop these entropic accidents, any more than you can stop breathing," she said. "But you never hurt anyone before, did you?"

"No," I admitted, "but . . ."

"Not even your ex-wife," Starr continued, "who I gather could provoke the Pope on Easter Sunday."

She shook her head. "I've been after Carl next door about that tree for six months," she said. "I could hear the wood groaning at night sometimes, in the wind: It was only a matter of time before it fell on someone. It would have been me, today, if you weren't here."

She stood up. "Come upstairs," she said. "I want to show you something."

Her bedroom, like the rest of the house, was old-fashioned but flawlessly cared for. She sat me on her brass bed, then flipped through a collection on vinyl albums she had next to a vintage turntable.

"This is it," she said, taking the record from its cover. It was the Beatles' "Sgt. Pepper's Lonely Hearts Club Band."

She put the record on the turntable then sat next to me on the bed. "Sister Odile bought me this album on my thirteenth birthday," she said. "I played it every day for two years."

I sat there in the warm, comfortable bedroom listening to the record with Starr's head on my shoulder. The music brought back my own teenage years, and I gave myself over to nostalgia. It was some time before it occurred to me

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how good the vinyl sounded. Almost better than it would have sounded new.

"Where did you find a copy in such mint condition?"

"I told you," she said. "This is my copy. I've had it since 1974."

"That can't . . ."

"Yes, it can." She straightened up and looked me in the eye. "You're not the only one with a certain gift: call mine localized entropic reversal, I suppose. Ever since I was a little girl, I've been trying to understand why I am the way I am."

A lot of things fell into place then: the beautiful old things Starr had; her physics hobby; her almost immediate appreciation for what was happening to me with my "accidents."

"I haven't been fair with you," she said. "I should have said something sooner. It's why I encouraged you to tell me all about your accidents. It's why I'm sure you didn't bring that tree down."

Starr leaned against me again and I held her close.

"How long have you known?"

"Since before I could read," she said, her breath warm against the side of my face. "I was so lonely."

It was another revelation in a day full of them, not to mention a near-death experience. I should have been a bundle of twitching nerve endings. Or unconscious.

But for the first time in a long time, sitting there with Starr, I wasn't afraid of the universe coming down around my ears. ■

IN TIMES TO COME

Our November issue leads off with a George Krauter cover for the beginning of *Sun of Suns*, a sweeping four-part serial by Karl Schroeder, a writer you'll be seeing for the first time in these pages—but, I strongly suspect, not the last. This story literally gives new meaning to the term "space opera": it has plenty of swash and buckles, but also one of the most unusual and exotic settings you've ever seen. It isn't set in interplanetary space, exactly, but rather in—well, you'll see. You'll be plunged right into the story and it may take you a while to get the full picture of where that is and how it all fits together, but I think you'll find it quite a ride. Put it this way: I've seldom seen a story richer in material for the illustrator to work with, or ideas for the reader!

We'll also have "The Diversification of Its Fancy," a new novella set in the "springer" universe John Barnes launched here some years back, plus stories by Thomas R. Dulski and Richard A. Lovett. Stephen L. Gillett, Ph.D., provides the fact article, on "Retirement Homes of the Gods." Red dwarves, the most abundant kind of stars in the galaxy, are commonly dismissed by exobiologists and science fiction writers as unpromising abodes for life—but they may have some special virtues that we shouldn't overlook. . . .

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THE REFERENCE LIBRARY Tom Easton

Lady of Mazes, Karl Schroeder, Tor, $24.95, 286 pp. (ISBN: 0-765-31219-0).

Mammoth, John Varley, Ace, $23.95, 364 pp. (ISBN: 0-441-01281-7).

Migration, Julie E. Czerneda, DAW, $24.95, 453 pp. (ISBN: 0-7564-0260-3).

Seeker, Jack McDevitt, Ace, $?, ? pp. (ISBN: . . .).

Ships in the Night, Jack McDevitt, Altair Australia Books (www.altair-australia.com/altair), $19.95 (plus $10 s&h), 317 pp. (ISBN: 0975-7208-0-5).

The Light-Years Beneath My Feet, Alan Dean Foster, Del Rey, $23.95, 245 pp. (ISBN: 0-345-46128-2).

Damned Nation, Nick Pollotta, Wildside Press, $14.95, ? pp. (ISBN: 0-8095-1099-8).

Starwater Strains, Gene Wolfe, Tor, $25.95, 352 pp. (ISBN: 0-765-31202-6).

Years in the Making: The Time Travel Stories of L. Sprague de Camp, Mark L. Olson, ed., NESFA Press, $25, 383 pp. (ISBN: 1-886778-47-7).

Homecalling and Other Stories: The Complete Solo Short SF of Judith Merril, Elisabeth Carey, ed., NESFA Press, $29, 559 pp. (ISBN: 1-886778-54-X).

Voices of Vision, Jayme Lynn Blaschke, University of Nebraska Press, $14.95, 194 pp. (ISBN: 0-8032-6239-6).

The Science Fiction Poetry Handbook, Suzette Haden Elgin, edited by Mike Allen and Bud Webster, Sam's Dot Publishing (P. O. Box 782, Cedar Rapids, IA 52406-0782), $11.95, 126 pp. (ISBN: 1-930847-81-5).

If you spend much time online, you have surely encountered ISP home pages, news sites, and others that offer you the option of specifying what you are interested in. Once you have filled in the blanks to say, for instance, that you want to see reports of natural disasters, mating porcupines, and éclair recipes, reports on those topics are all that you will ever see again. Something very similar happens with the proliferation of special-interest channels on cable TV, as well, of course, as with the profusion of special-interest magazines.

Some people think this is great. Life is hectic, time is short, and why should you have to waste any of either looking at stuff that is of no interest to you? Others think it is regrettable, for if you do not also at least glance at a daily paper or TV news program, you run the risk of getting a very distorted, tunnel-vision view of the world.

Where will it go in the future? We are developing technologies that may someday allow us to filter everything in a similar fashion. Implants might block perceptions that don't fit your preferences or prejudices, perhaps even turning blacks into whites or vice versa. More implants might control your muscles so you don't trip over that ugly coffee table you edited out of the living room. Virtual and augmented reality systems may become capable of overlaying the real world with images that feel quite real to us. Live in a slum? Hey, it *looks* like a palace to you, and to any guests who

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download the templates. Software agents may become virtual agents that can let you be in several places at the same time, or talk to several people, or duck out on unpleasant conversations. Add in programmable matter, and images might even become real, or real enough for government work.

You get the idea, and so does Karl Schroeder, who in **Lady of Mazes** gives us a world—a "coronal" or made mini-world, really—where this has been taken to extremes. On Teven Coronal, children grow up in a "real" reality, but at puberty, their implanted filters kick in. Not only do they—like teens everywhere—experiment with belief systems, but they move in and out of matching perceptual worlds or "manifolds" made self-consistent with programmable matter and "tech-locks" that bar technologies inconsistent with beliefs and perceptions (want to live in the woods and eat fruit? Internal combustion engines won't even work in your manifold). Eventually, everyone settles in a manifold that suits them. A few prove able to reconfigure their belief systems flexibly enough to move in and out of similar manifolds; most cannot.

Life in Teven Coronal is complex but satisfying. But Livia Kodaly has an interesting history as one of the few survivors of a disaster that crashed the system. She is so flexible that she is sometimes accused of not believing in anything (just as happens in our own world to some scientists and other secular sorts). She even agrees when a friend asks, "Don't you feel even the slightest bit claustrophobic living in just one manifold?"

That's when mysterious outsiders appear, breaking the rules, overriding the tech locks, and destroying the walls between manifolds. For most people, this is disaster. Hoping to find a way to defeat the invaders and restore the status quo ante, Livia and friends escape the coronal and discover the Archipelago, a Solar System remade by god-like AI powers and populated by trillions of humans whose "inscapes" have no manifold-like walls. Instead, the superhuman AIs arrange one's world so everything works out and life feels fine. She soon learns that the people who founded Teven Coronal were trying to come up with a structured alternative to such chaos. But there are subversive forces at work in the Archipelago as well. All of human civilization is at risk, and only Livia seems to hold the keys that might save the day.

Livia is an interesting character, and her story is absorbing, albeit at times confusing, for the mazes of Schroeder's title are mazes of allegory as much as anything else. He is critiquing the human tendency to willingly don blinders that restrict knowledge, awareness, and potential. He is also critiquing the uses to which we put technology, the social constructivist view of technology, and a good deal more. If you have an interest in the relationships of science, technology, and society you will find this novel fascinating.

John Varley has lately been playing with retro modes, as in *Red Thunder* (reviewed here in November 2003). His latest, **Mammoth**, is another example, bringing us Howard Christian, a megabillionaire in the spirit of Howard Hughes, complete with movie star wife, a penchant for collecting, and a willingness to fund scientific research, such as the dig way up north that unearths a frozen mammoth, with a man tucked in beside it. Furthermore, the man is wearing a wristwatch and beside him is a strange device that surely has to be a time machine!

The original plan was to get some viable sperm from the carcass and create a hybrid mammoth-elephant for the circus Howard owns. That plan is still on, but now the hunt is also on for a man who has the math to think about time travel, even if he is trying to get the hang of trout fishing as a path to recovery from a

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nervous breakdown. Not that Matt Wright's talents are much help until a good deal later, after Susan Morgan has been summoned from the circus to take care of the pregnant elephants, they get interested in each other, and animal-rights lunatics have invaded the lab and bashed the heck out of Matt's would-be time machine, giving it a dent just like the one pried out of the permafrost. That's just what it takes to make it work, and soon Matt and Susan are marooned in the Pleistocene with the elephants. A bit later, they have returned to the present, right on Wilshire Boulevard, with a herd of mammoths. Howard is delirious, but for all his megalomanic greed, he can't have everything he wants.

Or can he? Before Varley answers that question, there's a lot to sort out, including where the heck Matt disappears to for the next few years and whether Susan can stand to keep working for the theme park built around the surviving mammoths (including the successful hybrids). There's also a couple of inevitable time travel paradoxes that Varley seems to ignore—but only seems, for he does not forget, and every little detail he puts into the story turns out to be important. That includes Howard's kleptomania.

You'll have fun with this one.

Julie Czerneda began a new and intriguing series—Species Imperative—with *Survival* (reviewed here in October 2004), in which salmon researcher Mackenzie (Mac) Connor was enlisted by the Ministry of Extra-Sol Human Affairs, represented by the yummy Nik Trojanowski, and Brymn, the first of the alien Dhryn ever to visit Earth, to investigate why many worlds are being attacked by something that leaves large areas stripped of all life. By the time she was done, the truth was out: The Dhryn metamorphosed into a "feeder" form and were surely responsible for the long-lifeless worlds of the Chasm as well as for the current threat. Invisible aliens called the Ro are feared by the Dhryn and may be an essential ally, except that they are not terribly forthcoming.

In the series' second volume, **Migration**, Mac remains an engaging character. She is trying to get her research station back into action after the devastation caused by the Ro. The presence of Ministry security forces isn't helping, and when an earthquake puts paid to her efforts, at least for awhile, she retreats to a family camp on the shores of a lake in northern Canada. But the Dhryn are loose, and worlds are dying. Soon a pair of mysterious aliens appear, ostensibly tourists, but in actuality bearing an invitation for Mac to participate in a grand effort at countering the Dhryn threat. The Ministry of Extra-Sol Human Affairs, again represented by Nik Trojanowski (still yummy, thinks Mac), bows to the inevitable, stops blocking alien access to Mac, and encourages her to go. The effort is centered in a New Zealand alien consulate, where Czerneda treats us to a glimpse of a quite appealing set of aliens and their culture. It turns out that she is to take charge of a major part of the effort, involving human and other researchers who had been studying the Dhryn home world. Soon her insights and prodding make it clear that that world had an orbit and a climate that made salmon-like migration essential for survival. Here is a root for the Dhryn behavior. But why are they despoiling worlds? What triggers their current migration and feeding frenzy? The answers lurk in long-held suspicions, but they only settle the immediate crisis. Enough remains for Czerneda to give us at least one more volume.

Recommended.

We last met Alex Benedict and Chase Kolpath in *Polaris* (reviewed here in December 2004). Alex hunts and deals in antiques—or better, since his time is over ten millennia in our future, antiquities, lost artworks, lost spaceships, ancient uniforms with inscrutable insignia,

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equally ancient and inscrutable electronic devices, and so on. Chase is his lovely assistant and chief investigator.

Now Jack McDevitt brings them back in **Seeker**, which opens with a disappointing attempt to retrieve artifacts from a long-lost station. Alas, someone beat them to it. The place has been plundered, and shortly after they return home, the artifacts show up on the market. At the same time, however, a woman calls, wanting to know whether a cup she has is worth much. A little investigation reveals it is nine millennia old and came from an ancient ship, the *Seeker*, still known for its role in hauling colonists to the vanished colony of Margolia.

Is it a clue that the *Seeker* exists out there somewhere, just waiting to be found? The cup appears to have been burgled years before from the home of a couple who had flown survey missions together for years. But they had quit, and soon thereafter somehow had the money to lease ships and go out on their own. Alas, the records are gone. There is no way to find out whether they discovered the *Seeker*. Nor is there a way to retrace their path.

Or is there? Alex has a talent for detection. Chase is no slouch herself. So despite setbacks and accusations of grave robbing, and through a long series of ruminations on history, human folly, and human nature, they persevere. And in the end . . .

Well, sometimes I think it is possible for there to be too much success. McDevitt has done his usual smoothly convincing job. The investigation develops with impressive inevitability, moving from interviews through the tracking down of a supposedly wiped AI in an alien museum and the discovery of a discrepancy in old, doctored logbooks to celestial mechanics. The central characters are congenial enough (even the frightening aliens). The villain, on the other hand, comes straight from Central Casting. And in the end what could have been a poignantly satisfying conclusion turns into something that, even though it nicely caps McDevitt's ruminations on history, folly, and humanity, feels almost sappy.

I still enjoyed it enough to give it a hearty recommendation.

If you want a serving of Jack's shorter work, **Ships in the Night** has just appeared Down Under (which means you'll be soaked a bit for shipping!). There are fourteen tales dating back to 1982, including a collaboration with Stan Schmidt ("Good Intentions") and a couple from these pages.

Have fun.

In Alan Dean Foster's *Lost and Found*, Marcus Walker, Chicago commodities broker, was abducted (along with a stray dog named George) by evil alien slave traders. He soon found himself sharing captivity with a poetic rhinoceroid and a conceited squid. In due time they were rescued by the Sessrimathe. But they're a long, long way from their respective homes, and though the Sessrimathe are nice as nice can be, Marcus feels the lack of productive labor. So as **The Light-Years Beneath My Feet** opens, he is industriously turning himself into a high-tech chef. He proves successful enough to become a social hit, and soon a representative of another species, the Niyyuu, is inviting the four castaways to come to Niyu. First, however, they must escape an attempt by the slave traders to reclaim their "property." And when it turns out that the Niyyuu aren't all that hot to help them find their homes, they must start scheming either to gain enough clout to be helped out, or to make themselves unpopular enough to be helped off the planet. Naturally, this being a novel, they succeed. Foster being Foster, the method is ingenious and the slave traders have to show up once more.

But don't expect Marcus to see Chicago just yet. This is only Book Two of the

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Taken Trilogy, and the way it's going, there could be more than one sequel.

Fans of Nick Pollotta's X-Filesish, MIBic Bureau 13 series will be delighted to learn how it all began in **Damned Nation**. The time is the Civil War, and President Lincoln is conferring with his generals about a mysterious wave of deaths afflicting the only lightly wounded and cursing the Rebels for stooping to the use of poisoned bullets. Suddenly a werewolf bursts through the window. Bullets do not stop the monster, for wounds instantly heal, but butler Joshua Witherspoon notices that the President's silver ring leaves a scratch that continues to bleed. So up goes the silver tea tray and WHAM!—down goes the werewolf. And a few minutes later J. P. Withers is a U.S. Marshall reporting to the president, with orders to go forth and root out the supernatural evil that has made itself a third force in the war.

Meanwhile, a doctor collecting supposedly poisoned bullets on the battlefield encounters a monster. A man is suckered by a beautiful damsel in distress and turned into a werewolf. The Confederates are blaming the Yanks for using poisoned bullets and killing lightly wounded Rebels when another werewolf goes for Jefferson Davis. But silver-edged rebel swords do the monster in, at which point the assembled generals call for the doughty Hammer to solve the problem.

But Marshall Withers is already on the job. He's an intelligent, observant, resourceful fellow, and though the clues are few, he is quite capable of following them to the point where he must flee for his life. But he also flees with a much better idea of what is going on, and when he meets the Hammer, he has the ally he needs.

Damned Nation looks like fantasy, though the evil Drell masterminds have clearly science-fictional components. So it's a bit of a hybrid, stamped with the inimitable Pollotta humor (an endless stream of wisecracks, puns, winks, and nudges) and imbued with the feel of the pulps. If that's your cup of tea, then you too may soon be a Pollotta fan.

The latest collection from Gene Wolfe is **Starwater Strains**. In it you will find twenty-five stories—SF, fantasy, horror, and unclassifiable, some quite short ("The Dog of the Drops" is told largely in heavy dialect, which both makes the tale feel longer and conceals the final bite quite effectively). The longest is the novella "Viewpoint," which takes a novel view of reality shows. "Empires of Foliage and Flower" is an addition to the Book of the New Sun series previously seen only in chapbook form.

Gene Wolfe being Gene Wolfe, to say this book is worth its price is to offer faint praise indeed. His prose is limpid, his characters and scenes convincing no matter how outré, his imagination extraordinary in its range and strangeness, his mind remarkable for originality and perceptiveness.

This one is essential to your collection. It is also the perfect gift for anyone who asks you, "Who's this Gene Wolfe guy?"

L. Sprague de Camp was one of SF's greats. He helped make the Golden Age so grand, and he kept on producing great SF and fantasy until near his death in 2000. Among the novels for which he is fondly remembered is *Lest Darkness Fall*, which dropped a modern in ancient Rome and set him to preventing the end of the empire. You will find this tale, along with thirteen more treatments of time travel and alternate history (including a couple of poems), in **Years in the Making: The Time Travel Stories of L. Sprague de Camp**. And this is just Volume One of the collected de Camp works.

Judith Merril started writing in the 1940s and did a number of memorable stories, some alone and some in collabo-

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ration with others. She became best known, however, for criticism and for the anthologies she edited. Her solo short work is collected in **Homecalling and Other Stories: The Complete Solo Short SF of Judith Merrill**. I never found her as much fun to read as de Camp, but she is just as worthy of a place in the library.

The latest in the University of Nebraska's Bison Books series is Jayme Lynn Blaschke's **Voices of Vision**. Over the last few years, Blaschke has interviewed seventeen editors (including our own Stanley Schmidt), novelists (Robin Hobb, Patricia Anthony, Charles de Lint, and Elizabeth Moon), comic book creators (including Neil Gaiman), and Old Masters (Samuel R. Delaney, Gene Wolfe, Harlan Ellison, and Jack Williamson). Those interviews are here assembled for your edification.

As usual in interview books, you get an assortment of views, comments, reflections, and so on that can illuminate the persons behind work you enjoy. It helps when the interviewer asks intelligent questions and draws his subjects out, and that is precisely what Blaschke does. It also helps that the interviews are still fairly fresh; there's nothing here from before the late nineties.

Suzette Haden Elgin's **Science Fiction Poetry Handbook** first appeared in 1986 to benefit the Science Fiction Poetry Association (which Elgin founded). A revised version is now available, still for the benefit of SFPA, and it is well worth noting that Elgin's efforts are invaluable for all those who want to know what an SF poem is, how poems are constructed, and how to market and promote one's work. If you are or know a would-be SF poet, this one's for you. ■

Continued from p. 7

class, and before doing so, I asked one of its students what they'd been studying so far. When he didn't mention stellar evolution, I asked about it, and he said he thought it had been mentioned one day. Admittedly, I only talked to one student, and I didn't see anybody's notes on the whole course or ask the professor to show me or explain his syllabus. But I did find myself puzzling over what kind of astronomy course could be taught these days without a *lot* of discussion of stellar (and cosmic and planetary) evolution.

In the world of real science, astronomy and biology have become far more than mere description and taxonomy. They're the study of magnificently dynamic processes on the grandest and tiniest scales. Students need and deserve to learn that, both for their own benefit and to insure the future vitality of science in this country. Will they find enough courageous teachers, principals, and superintendents to make sure that happens, despite the effort of ill-informed parents and cowardly or misguided colleagues? ■

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BRASS TACKS

Dear Stan,

If I ever cancel my subscription to *Analog*, it will be as a direct result of Jeffery Kooistra. Several times over the last decade or so, he has chosen to wander into the field of medicine, where he demonstrates clearly that he can't tell fecal matter from brown shoe polish. His latest foray comes in his Alternate View article on "Kicking the Sacred Cow," where he reiterates the author's doubts about HIV as the cause of AIDS.

Let me make it clear that HIV does cause AIDS, and that the proof is overwhelming. But Jeffery sets up a straw man when he asks for "the reference, or better yet, the paper itself." This would be like asking for the definitive paper on the big bang, or the cosmological constant, or the nature of dark matter, etc. There is, if my readings of your journal are correct, an evolving body of knowledge on these subjects. So it is with HIV. Because of the complexity of the topic, I can't supply Jeffery or your readers with a persuasive argument; but I will give you a template for doing your own search on the subject.

First of all, when you look into this subject, understand that the early experts on AIDS research were in a highly publicized and politicized race to learn about this growing epidemic. Human nature being the beast that it is, early writings were less than perfectly rigid. Articles went to the media before going into journals. (See "cold fusion" for an example closer to home.) Second, there were people early on who had doubts about HIV, some very credible. Dr. Duesberg and Dr. Papadopulos-Eleopulos are the most widely cited experts who call into question the nature of AIDS. Dr. Papadopulos-Eleopulos and cohorts (the Perth Group) doubt that HIV is even a virus, and have been widely discredited by mainstream researchers and "dissidents" alike. Dr. Duesberg was considered a world's authority on retroviruses; thus his writings are harder to refute out of hand. However, he makes many dogmatic claims that are patently false, a habit that eats deeply into his credibility on other subjects. Most other "dissidents" drink from the well of these two authors. Third, and most important, is that "dissidents" spend much more time trying to sell their opinions than do "orthodox"; thus the Internet is rife with their writings. (Examples of this phenomenon would include the Holocaust and cosmology. No credible historian doubts the fact of the Holocaust, but the net is full of naysayers. In your own field, Creationists are not invited to seminars to discuss the age of the universe. Their horse doesn't even get into the race.)

With this template in place, Mr. Kooistra and others can Google HIV + AIDS + Koch's Postulate and get their fill of "brown shoe polish." In the meantime, I'd recommend against volunteering, as Dr. Duesberg has, to be injected with HIV+ blood, as a way of demonstrating its lack of risk.

Lastly, I save my greatest disappointment for the editors of *Analog*, who don't seem to apply much vetting to Mr. Kooistra's medical jaunts. It makes me wonder how credible some of your other fact-based articles are; ones that I can't judge on. Please try to be more dis-

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ciplined in the future.

K. A. Newman M.D.

Evidently it's time to reiterate the difference between "fact articles" and "Alternate View" columns. The former are *vetted quite carefully, and if a mistake slips through, we will make every effort to publish a correction. "The Alternate View" is something quite different: a column of late-breaking news and/or opinion delivered by two alternating authors in whatever proportions those authors choose. The content of "The Alternate View" is typically an alternative (the other meaning of the title) to common knowledge and/or prevailing wisdom, and likely to be controversial. It is up to the readers to continue the controversy, as you've done here. But in general, since these columns are intended to present controversial opinions and/or news that may not be fully tested, the editors will not intervene unless there is a very clear and blatant error or actionable statement. But I emphasize that this applies only to "The Alternate View," not fact articles.*

Dear Dr. Schmidt:

In "Alibis, Safety, and Freedom" (May 2005), you discuss Robert J. Sawyer's hypothesis that the concept of privacy has outlived its usefulness and his notion of an alibi archive containing comprehensive recordings of our lives. Let us consider that first hypothesis separately. You relate two of Sawyer's reasons for desiring privacy—avoiding shame and getting away with the unethical or illegal—and add that you can imagine "many smaller reasons," including shyness and surprise gifts. I contend that privacy has a huge value. Consider that privacy is at the core of democracy: the voting booth curtain. This simple device protects people from bribery and coercion. Privacy frees people to vote honestly, and that is certainly a major reason to desire privacy.

Privacy also shields your valuables from theft. I recently received valuable photographic equipment shipped in an unmarked box. Privacy gives you the opportunity to develop a business plan before your competitors beat you to the punch. Privacy prevents other students from cheating off your homework. A private home phone number lets you relax away from business customers after hours. Privacy protects some people from stalkers. Sometimes privacy shields religious minorities from persecution. *Analog* would find it difficult to make a profit if readers read every article before publication. You touched on some of these, but they are not minor matters. I disagree that privacy has outlived its usefulness; privacy is integral to our society.

Some of these elements are not separate from the alibi archive. If we had no privacy, there would be greater opportunity for theft, but it would be deterred if the threshold of archive access were set low enough to solve petty thefts. Other problems of non-privacy would not be solved by the archive. The ability to profit from an idea or business plan would plummet (thus decreasing the incentive to be clever), and crimes resulting from mental problems not deterred by the threat of punishment would continue, or perhaps increase given more opportunity. However, the idea of the archives is to take away some privacy, but not most. The archives idea does not embrace the hypothesis that privacy is outdated. It honors privacy by preserving almost all of it with a high access threshold.

Ideally, we would still have privacy if the alibi archives were maintained in a secure manner, subject to investigation and disclosure only under strict, well understood, and accepted rules. Furthermore, we would have to *know* that the rules were strict and enforced and could not be relaxed in the future. Of course, we have no ideal world, and the archives would be a Fort Knox of information, immensely valuable and necessarily guarded as such. Before we could

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build such a fortress, we would have to build a trustworthy government and trustworthy processes for maintaining information security. We have neither, and history has proven us inadequate at each.

If it were just embarrassment and illegal activity that were protected by privacy, we might justify putting those eggs in one basket. Since the eggs are actually our freedom, our safety, and our economy, a single basket is an unacceptable risk.

On another point, you pointed out that a complete record is little use in proving a suicide bomber guilty. Yes, but it would be of use in finding the people who recruited, guided, and supplied the bomber, and I suspect they are the bigger problem.

Eric Postpischil

Dear Mr. Schmidt,

[Regarding the May 2005 editorial, "Alibis, Safety, and Freedom":]

Bull. Reasons for privacy? You missed bigotry and politics. I do *not* want my neighbors, down here in the Bible Belt, to know that not only am I not a Christian, but what kind of non-Christian I am. That could well result in things being burned on my lawn, and other threats.

Then we can talk about how many people want records of their sex life, or sitting on the toilet.

Finally, there is the matter of who would assure the privacy of those records. Consider the workers in India who stole bank account and PIN numbers, and hundreds of thousands of dollars out of US bank accounts. Or consider the fact that Vice President Dick Cheney obviously gave a pass to his staff to leak the name of Valerie Plame to the press, purely for reasons of political revenge.

As someone whose attention span to the news is longer than fifteen minutes, and as a computer professional to boot, I have zero confidence in the unobtainability of such records, did they exist. Thank you, but I'll keep my privacy. To quote a certain other publisher and editor, a Mr. B. Franklin, "They that can give up essential liberty to obtain a little temporary safety deserve neither liberty nor safety."

Mark Roth
Port St. John, FL

Dr. Schmidt,

Laura M. Kelley's article ("Big Brother Inc.," May 2005) includes a lot of technical material on how surveillance can work or might work, leading logically to the conclusion that we should allow none of it. After all, if you allow police to carry guns, they will occasionally misuse them.

No attention is paid to how surveillance is actually working. Although every terrorist has been a Middle Eastern Muslim, it is forbidden to "profile" that or any other group. Airline passengers like aging grandmothers are strip-searched and questioned while an obvious candidate for martyrdom goes smirking though, and pilots are threatened with arrest if they question or reject any passenger.

Banks with Muslim connections transfer large sums of money to questionable groups overseas, and the persons originating the transactions are able to claim the money was for charitable groups in the Middle East—certainly not to purchase Stinger missiles or plastique.

Thousands of unknown people cross our borders, many of them who fit the profiles of terrorists, and our border patrols cannot stop or even question them, much less take fingerprints or DNA.

In reality, our country has much too little surveillance, and we are not allowed to use much of what we have. Three cheers for the ACLU and other liberals, who already make sure ordinary criminals walk the streets—to be consistent, they seek to allow more Bin Ladens on those streets.

Rinehart S. Potts
Glassboro NJ ■

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UPCOMING EVENTS Anthony Lewis

6–10 October 2005
THE WITCHING HOUR (Harry Potter Symposium) at Salem MA. Guests of Honor: Charles de Lint, Nancy Farmer, Tamora Pierce, Charles N. Brown. Registration: $180 until 1 September 2005, $200 at door. Info: www.witchinghour.org; organizers@watchinghour.org. The Witching Hour, Box 4423, Troy MI 48099.

7–9 October 2005
ALBACON (Albany area SF conference) at Crowne Plaza Hotel, Albany NY. Guest of Honor: Terry Brooks. Fan Guests of Honor: Byron & Tina Connell. Special Guest: Travis Tea. Registration: $40 until 15 September 2005, $50 at door. Info: www.albacon.org; chair@albacon.org; Albacon 2005, Box 2085, Albany NY 12220-0085.

7–9 October 2005
CONCLAVE 30 (Michigan SF conference) at Holiday Inn South Convention Center, Lansing MI. Guest of Honor: Wen Spencer. Artist Guest of Honor: Butch Honeck. Science Guest of Honor: Steve Collins. Fan Guest of Honor: "Uncle" Kage. Music Guest of Honor: Tom Smith. Registration: $35 until 15 September 2005, $40 at door. Info: www.conclavesf.org; conclave@conclavesf.org. ConClave, Inc., Box 2915, Ann Arbor MI 48106.

7–9 October 2005
CONTEXT 18 (Central Ohio SF conference) at Holiday Inn on the Lane, Columbus OH. Guest of Honor: Michael Swanwick. Editor Guest of Honor: Gordon Van Gelder. Horror Guest of Honor: Gary Braunbeck. Special Guest: Mike Resnick. Info: www.contextcon.com/; contextsf@yahoo.com; Context, Box 163391, Columbus OH 43216.

7–9 October 2005
SILICON 2005 (Silicon Valley SF conference) at DoubleTree Hotel, San Jose CA. Artist Guest of Honor: Phil Yeh. TM: Bill Blair. Registration: $55 until 14 September 2005, $65 at door. Info: www.siliconventions.com; info@siliconventions.com; SiliCon 2005, 1009 East Capitol Expressway 415, San Jose CA 95121-2415.

7–9 October 2005
VCON 30 (British Columbia SF conference) at Vancouver, BC Canada. Registration: C$50 until 15 September 2005, C$60 at door. Info: www.v-con.ca/; VCon 30, 209-2166 West 8th Ave., Vancouver, BC, Canada V6K 2A4.

14–16 October 2005
CAPCLAVE 2005 (DC area SF conference) at Hilton Silver Spring, Silver Spring MD. Guest of Honor: Howard Waldrop. Fan Guests of Honor: Patrick & Teresa Nielsen Hayden. Info: www.wsfa.org/capc05/; MJW@press.jhu.edu.

21–23 October 2005
MILEHIGHCON 37 (Denver area SF conference) at Four Points Sheraton Hotel, Denver CO. Guest of Honor: Alan Dean Foster. Artist Guest of Honor: David Mattingly. Registration: $34 until 30 September 2005, $36 until 10 October 2005, $37 at door. Info: www.milehicon.org; lindane1@ix.netcom.com. MileHiCon 37, Box 101322, Denver CO 80250-1322. ■

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